

Food and Nutrition Studies Programme

**Food and Nutrition
Surveillance and Planning
in Kilifi District, Kenya**

A Model for District Based
Multi-Sectoral Policy Formulation and Planning

J.O. Owuor & W.O. Okello

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SUMMARY

Chronic malnutrition, an outcome of complex multi-dimensional problems, has been consistently high in Kilifi district despite much effort being put to improve nutrition. Nutrition survey conducted in 1982, for example, showed that 53 percent of preschool children were malnourished. By 1994, the prevalence of malnutrition had not shown any significant improvement as 50 percent were classified as malnourished (CBS 1983, CBS 1995). This means that for the past one decade no significant improvement in nutritional status has been observed. The prevailing situation is a cause of deep concern and calls for a new approach to planning for nutrition that will take into consideration the weaknesses in the existing planning procedures.

The objective of this paper is to present an alternative approach to nutrition planning in Kilifi District taking into account the multidimensional and multidisciplinary nature of nutrition. The single unifying theme is participatory and intersectoral approach.

The methodology includes an assessment of the planning process, problems and constraints relating to nutrition and data management for decision making at district level, and secondly, the process of implementing the approach. The approach has an objective of breaking the bottlenecks in the institutional linkages identified in the assessment through a unified system for solving nutrition problem. The methodology borrows a leaf from the "Triple A" (Assessment, Analysis and Action) approach (Jonsson U, et al 1993) by building a district hypothetical causal model for analyzing nutrition problems, selecting indicators of food security, health and nutrition from the model for surveillance, analysis and interpretation of trends of the indicators and selecting alternative sustainable interventions and strategies for improvement of food and nutrition in the district.

The methodology has two infrastructures: Planning and Data (surveillance). The former articulates the demands for information on food security and nutrition in the district while the latter supply information on indicators to guide decision making related to food security and nutrition. The infrastructure adapts the institutional framework that already exists so as to make it applicable to the needs of the district decision making and to improve on the current approach to nutrition planning.

The existing data captured through the health and agriculture information system, with some modification, are used in the data infrastructure. The statistics units in each of the sectors (sectoral sub-committees) are responsible for data processing while the analysis and preliminary interpretation of data into information for decision making using the hypothetical causal model is carried out by the core committee (multi-sectoral).

Central in the operation of the infrastructure is the District Food and Nutrition Committee (DFNC) composed of the main government sectors and non governmental organizations concerned with food and nutrition in the district. The District Development Office chairs DFNC meetings (attended by selected members of the sub-committees which forms the core committee) and coordinates its activities. The DFNC has the objective of analyzing and interpreting data into information and recommendations for decision making. The output is in the form of Kilifi District Food and Nutrition Bulletin containing multisectoral information on socio-economic, food security, health and nutrition indicators produced on a quarterly basis.

Linkage of data to decision making is through the District Development Committee (DDC) where the recommendations of the DFNC are tabled by the DDO who chairs the committee and is the secretary to the DDC. The data can also be used at sectoral level for decision making.

Preliminary results of the implementation of the alternative approach show that the existing framework can be improved to develop a simpler approach that can be used to formulate a problem, define important situations in which to test alternatives, judge the reliability of data and most important design an approach that can be evaluated.

For example, food security analysis at divisional level using caloric and protein requirements for various population age groups and the food production data show that Kaloleni, Magarini and Malindi are food insecure. The analysis also show the requirements for age groups considered to be vulnerable. Secondly, crop patterns and expected returns can also be calculated and used for divisional food production plans.

Analysis of health and nutrition indicators for a four month period in 1994 indicate that Malaria was prevalent in Kaloleni and Bahari while diarrhoeal diseases were mainly reported from facilities in Magarini and Bahari.

These analyses cannot be used to provide conclusive information due to the periods when they were collected, however, they provide an insight into how the planning and data infrastructure will be used for district level planning.

1.0 INTRODUCTION

Great emphasis is now placed by the government on achieving food security and the need to understand the factors that cause malnutrition in order to develop appropriate and practical measures to eradicate malnutrition and poverty at regional level. For this reason, the government shifted the responsibility for planning and implementing rural development to the district level. The main aim of shifting planning from headquarters to the district was to “broaden the base of rural development and encourage local initiative in order to improve problem identification, resource mobilization and project design and implementation (GOK 1987).

In line with the district focus for rural development, the Food and Nutrition Planning Unit (FNPU) of the Ministry of Planning and National Development and The Food and Nutrition Studies Programme (FNSP) initiated a joint programme on District Analysis and Evaluation. In this assignment are twin projects District Nutrition Planning (FNSP 16) and District Nutrition Surveillance (FNSP 20) whose activities contribute towards monitoring of food security and nutrition indicators, facilitate flow of information for food and nutrition planning and decision making and strengthen the capacity of the district personnel to generate, analyze and use data for localized nutrition planning. The importance of information management and the eventual use for planning was the origin of integrating the two projects, FNSP 16 and 20. This was considering the fact that nutrition planning as in any other planning process begins with the definition of the problem (nature scope and trends), and surveillance is the continuous analysis of food security, health and socio-economic indicators in order to make decisions that will improve nutritional status of the population.

Although there has been improvement in nutritional situation in Kenya, the nutritional condition of people in certain regions, particularly in the coastal district of Kilifi have been unsatisfactory and cause of deep concern. Periodic household based nutrition surveys conducted in 1982 and 1994 indicated that 53 percent and 50 percent respectively of young children were classified as chronically malnourished¹. It is on this basis that Kilifi District was selected (after an exploratory assessment that included Kakamega and Kajiado) to pilot an alternative approach to district nutrition planning.

Initial assessment of the planning process in the district showed that disjointed analysis of nutrition problems, lack of collaboration between ministries and lack of

¹ Using the minus 2 Standard Deviation cut off point of the WHO/CDC/NCHS reference data for height-for-age index

data disaggregated to divisional level have impeded nutrition planning. Following the assessment, a workshop was organized bringing district personnel concerned with food and nutrition in order to stimulate a series of activities leading to the development of a district nutrition planning apparatus through participatory approach.

This report presents the steps in the development of the proposed approach to district nutrition planning. The report is organized as follows: part one deals with the initial assessment of the problems and constraints in nutrition planning process and data management procedures. This is done concurrently with the assessment of the nutritional problems. The second part deals with the implementation of the alternative approach to nutrition planning. Lastly, some of the observations are made of lessons learnt during the initial assessment, and the implementation of the approach. It is envisaged that the experiences gained during the implementation will be used to refine the approach further and replicate the same in other districts in Kenya.

2.0 NUTRITIONAL PLANNING APPROACHES AT DISTRICT LEVEL

This section presents the nutrition planning approaches that have been used in the district. At the initial stages, an exploratory phase which involved interviews with the various actors in the planning process was carried out. Two areas namely the planning process and the use of data for decision making were examined.

2.1. District Nutrition Planning Process

Food and Nutrition Planning at the district level forms part of the overall development planning in the district and it is the process that involves all implementing sectors and organizations whose mandates and or activities have a bearing on food security, food consumption and nutritional health, both at individual, household and aggregate level and all factors that relate to it. The combination of all these sub-entities constitute what is referred to as 'nutrition security'. The term nutrition security was introduced at the International Conference on Nutrition in Rome in 1992 and can be defined as the appropriate quantity and combination of inputs such as food, nutrition/health services, and caretaker's time in order to ensure an active and healthy life at all time for people. Food security on the other hand refers to access by all people at all times to enough food for an active healthy life (Reutlinger, S. 1987). The population can either be self-sufficient on food and or have access to purchases or both. Nutrition security has both a material dimension (food and nutrients as substrate) as well as a behavioral dimension ('care' provided by family members); it also includes the biological utilization of energy and nutrients by the individual. Food security is therefore a subset of nutrition security. Central in the whole process of food and nutrition planning are the actors who have to ensure that the various planning activities are carried out.

There has been a tendency in government operations to separate food and nutrition. Food has often been seen from a productive perspective and is more closely associated with agriculture while nutrition assumes a health dimension and therefore, gets linked to the health ministry. The link between adequate intake of food which can be traced back to food production (if purchases are not taken into account) and efficient utilization of food can however, be demonstrated better by the use of causal model as will be seen in Figure 3. In the past, several well intended and technically sound development projects in general, and rural agricultural development programmes in particular, has ended up worsening the nutritional and health problems of population groups, and reinforced the social inequalities they were intended to remedy due to disjointed analysis of nutritional problems and lack of effective co-ordination. As a

means of demonstrating the close link between Food and Nutrition, International Fund for Agricultural Development (IFAD) initiated Nutrition Committee (DNC) in Kilifi district to assist in planning and implementing Nutrition component of Kwale-Kilifi Development Programme (KKDP). Such an arrangement, it was hoped, would allow members to deliberate on the activities done by each sector and plan together in areas joint interest. The Chairmanship was under the Ministry of Agriculture. The programme came to an end in July 1995. A similar arrangement exists at the headquarters except the co-ordinator is the Ministry of Planning and National Development, which is considered a neutral body. As will be seen later, the present DFNC has adopted the same structural arrangement. The sectors represented in the committee included Agriculture, Health, Culture and Social Services, Education , Local Government and IFAD.

The committee was, however, faced with several of administrative problems including:

- The mode of operations being geared more towards agriculture yet nutrition covers all sectors
- Funds fully controlled by the Ministry of Agriculture
- Bargaining power too low due to low cadre officers
- Considered women club due to its composition
- Committee not clear how its activities will lead to the achievement of stated objectives & goals

The issue of control of funds by the Ministry of Agriculture brought much misunderstanding within the committee and the various sectors therefore tended to work independently of one another. There was therefore no effective forum through which the sectors concerned with food and nutrition could come together to analyze food and nutrition situation in an enabling environment using the available data and come up with targeted interventions which can assist in the reduction of malnutrition in the district.

2.1.1 Data Management: Process and Problems

There are reasonably developed institutional structures in Kilifi for routine and periodic data generation. They include several variables that can be related to nutritional outcome. The agricultural reporting system collects routine data at locational level, and the health information system at facility level (i.e, dispensaries, health centres and hospitals) on a monthly basis while the household sample surveys of CBS collect periodic data on socio-economic indicators. However, as mentioned

elsewhere in this report, lack of data collation demonstrating that indicators of nutritional status can together with food security, health and other socio-economic data be used to provide information of deprivation about different areas in the district has been a constraint to nutrition planning. This can be attributed to the lack of a methodology or capacity to produce such information and are due to several reasons.

Firstly, the administrative arrangement for data flow and information is mainly vertical, that is, data from the grass-root level for each ministry are sent through a hierarchy usually location, division and ultimately to the district level for aggregation and basic analysis. The information and reports from these analyses that are usually based on a standard reporting format designed at headquarters, are then sent to provincial offices for transmission to headquarters for national level planning. Copies are kept in the departmental offices at district with minimal dissemination. Secondly, the potential use of the data for district level planning has been insufficiently specified, resulting in limited interpreted information on the changes and trends of welfare indicators on a year to year or season to season basis although information exists in the form of reports or as raw data. Thirdly, data produced by various sectors are put to minimum use due to non comparability at district level as a result of different levels of disaggregation and no correction being made for missing data in working out trends. The latter two constraints can be attributed to the limited analytical skills currently available at the district. Fourthly, the reliability of data in some cases may be questionable as concerns accuracy and reporting, especially in areas with infrastructural problems.

In addition to these constraints is the monopoly of data by departments. Some departments are not willing to share out information and there is resistance unless formal request through correspondence is made. Such cases have been observed even when multisectoral documents are being prepared resulting in information deficient documents for planning. Observations in the public sector by Habicht show that information for nutrition surveillance is only useful if made public, since the major ministries like agriculture and health do not have power to influence policy (Habicht et al 1990).

2.1.2 Nutrition Planning in the Health Sector

The Planning agency for the Ministry of Health at the District is the District Health Management Team (DHMT) whose members are entirely from the Ministry.

Nutrition planning is not isolated from the overall health planning but forms part of health planning. The nutrition planning activities include:

- identification of nutrition needs
- setting up objectives
- setting up targets
- working out strategies for the attainments of objectives
- budgeting
- implementation

In the District Plans, there has always been lack of an in-built Monitoring and Evaluation system.

The activities currently being carried out include nutrition education, therapeutic feeding in paediatric wards and issuing of food supplements in maternal and child health clinics and in feeding centres amongst others. The identification of the 'communities needs' tend to be worked out at the headquarters and infact, most of these activities are countrywide with little targeting at the community level. The little targeting can be attributed to none use of data at the district level for planning purposes.

2.1.2.1 Health Data

The health information system collects data at facility level on health status of the population by administrative areas to allow the computation of prevalences and incidences of diseases. Data flow is at three levels namely, dispensaries at locational level, health centres at divisional level and hospitals at district and in some cases, divisional level. Currently, data on patients visiting the facilities are entered in standardized medical tally sheets that are compiled and sent to the District Medical Records unit for editing and compilation. In general, data on the previous month from the peripheral facilities are expected in this unit by 15th of every month but due to irregular flow and in some cases loss of data, timeliness and accuracy of information often deteriorates. This is attributed to lack of supervision and absence of follow up due to inadequate provision of transportation and postage facilities.

The health system generates large amount of data which in most cases are not processed on a monthly basis, hence stored in raw form. Processing all the information is currently not feasible, therefore only data required for urgent administrative planning within the department, for example ordering of supplies, organizing visits and staff scheduling are given priority.

Data from the facilities are processed manually either by hand or calculators at the Medical Records unit. It is at this level that inaccuracies in entry or gaps in data from the peripheral facilities are detected and in cases of gross inaccuracies, follow ups are done to rectify the situation. The processed data are currently presented in the form of tables and presented in monthly and annual reports.

2.1.3. Nutrition Planning in the Agriculture Sector

The mode of nutrition planning in the Ministry of Agriculture is no different from that of Health. Food production planning is done within the overall agricultural planning. It is done in the agriculture office and follows the same procedure as that of health, thus the planning activities include:

- identification of needs
- Setting up objectives
- setting up targets
- working out strategies for the attainments of objectives
- budgeting
- implementation

In the District Plans, there has always been lack of an in-built Monitoring and Evaluation system.

The Ministry is charged with the responsibility of ensuring that enough food is produced through the proper use of crop husbandry and the activities include training, extension work and demonstrations. As with the Ministry of Health, most of the activities tend to be designed at the headquarters. Data collected at the district is not used for the planning at community level but is transmitted directly to the headquarters for nation wide planning. The other sectors are also not given a chance to use the data. However, given the peculiarity of the districts and communities in terms of diverse socio-economic status, there is a need to deliberately plan for nutrition for certain groups of the population or certain geographical areas. The Ministry of Agriculture generate lots of data which can be analysed at the district for prioritization of certain agro-ecological zones and socio-economic groups for action.

2.1.3.1 Agriculture Data

The types of agricultural data currently being collected can be divided into two categories. The first category are data that give current information and are reported on a daily basis (for example commodity prices of the main staples), on a weekly basis (e.g. data on farm input availability) or on a monthly basis (namely, crop

production and area under crops, livestock product sales and prices). The second category are data reported quarterly and annually which include crop area, crop yields by agricultural season, livestock numbers and production on irrigation schemes.

The data in this system are collected by the frontline extension workers at sub-locational level and involve quantitative and qualitative collection methods based on estimation and with minimal or no actual measurements. Collection is done from subsistence small holdings scattered over wide distances in the district. Ideally, a representative sample of farmers should be covered, but with the current resource constraints, only selected contact and group farmers are visited, however, the representativeness of these farmers for statistical analyses is not known. As such, data are generally unreliable due to reporting errors and systematic bias caused by certain types of farmers not being covered. Data flow and processing problems in this system are similar to those in the health system. The level of analysis in the current situation is only basic and within the skills and time available provides only frequency and percentage distribution in tabular form. Attempts have been made to present graphs, maps and histograms, however, irregular flow of information, limited analytical skills and lack of supportive equipment for analysis of data have been the major constraints.

2.1.4. Other Sources of Data

The Central Bureau of Statistics (CBS), the main government data collection agency, collects cross-sectional data on socio-economic variables at specified periods from National Sample of frame in the district. The data collected specifically for national level planning include: household characteristics, food consumption patterns, income and expenditure, education, health and nutritional status of children under five.

The survey instruments for data collection are designed at headquarters and implemented by the permanent field staff trained on interviewing techniques and data entry on pre-coded questionnaire. Data are primarily collected from households sampled from the established CBS National Sample Frame, checked by supervisors in the field, and sent to the district office for further editing before dispatching to headquarters.

The data flow is similar to other system already discussed in being hierarchical with information ending up at headquarters. Analysis is not done at district level since the data requires sophisticated analytical techniques not available in the district. The information produced in this system is specifically for national planning because the

type of sampling procedures applied do not allow for disaggregation to sub-district level.

Information in this system, can be used to assess changes in the general level of living standards at district level and also complement data routinely generated by other ministries.

The Ministries of Education, Culture and Social Services, Land Reclamation Regional and Water Development collect and generate nutrition related data. The Ministry of Education collects data on the school feeding programme in specific areas (ASAL mainly) and growth monitoring. The growth monitoring data is collected at pre-school level by teachers on a monthly basis for the National Centre for Early Childhood Education (NACECE). At school level, the data is used to inform parents of children diagnosed as malnourished to seek remedial interventions. The processing and eventual use of these data at district level is not clear since it is transmitted directly to headquarters with no feedback/feedforward system (from the central level to the district and from the district to the subdistrict level, respectively).

Information on malnourished children admitted for rehabilitation at the Family Life Training Centre (FLTC) under the Ministry of Culture and Social Services, is collected and aggregated by division on a monthly basis. The data are processed manually and sent to headquarters and are currently used for allocation of funds for FLTCs at national level.

Water pollution control data are collected by the Ministry of Land Reclamation, Regional and Water Development on a weekly basis from various water sources scattered in the district, processed manually and aggregated to district level and information is reported annually. The present constraint is the availability of equipment for analysing water samples hence there are data gaps which affects the accuracy of the information.

The inaccessibility of data to all sectors results from lack of inter-sectoral collaboration within the various ministries. Given that most of the programmes and projects concerned with food and nutrition are nationwide and hence formulated at the headquarters, the community is given little chance in the identification of their needs, taking decisions and establishing mechanisms for meeting these needs. In other words, the community is not involved in the planning process in most cases. With the introduction of the district focus for rural development, it is clearly stated that the community is to take a major role in the identification and implementation of

projects. The lack of active community involvement may result in wrong identification of the nutritional problem and hence insufficient adaptation of interventions to realities as a result of misunderstanding or ignorance about the community. Consequently, the main constraints in district nutrition planning are lack of data in a suitable form and disaggregated to the divisional level, lack of funds for the implementation of projects/activities, disjointed analysis of food security and nutrition problems and a top-down approach to planning (see Figure 1).

3.0. ALTERNATIVE APPROACH TO DISTRICT NUTRITION PLANNING

Evidence that chronic malnutrition, an outcome of complex multi-dimensional problems, has been consistently high in Kilifi yet many sectors have put in much effort in trying to improve the situation calls for alternative approaches to nutrition planning. To address the root causes of this persistent problem, constraints in the planning process and the use of information in decision making needs to be re-examined.

The initial assessment of the nutrition planning process in the district has already revealed the following which are the basis for the alternative approach. One, the nutrition planning process in the district is disjointed, meaning that each sector carries out its own planning and implements nutrition projects, and or programmes in isolation. This has resulted into duplication of effort by different actors and ultimately inadequate reach of nutrition services. Related to this planning anomaly, is the use of data for decision making. Data analysis and interpretation are largely for national level planning and as a result, the disaggregation and accuracy for district level planning have been compromised leading to limited information for the decision making on nutrition.

The alternative approach for the district nutrition planning incorporates the following processes.

1. Intersectoral collaboration and participatory approach to solving nutritional problems
2. Using the existing structures to implement food security and nutrition surveillance to provide information for district nutrition planning.

4.0. IMPLEMENTATION OF THE DISTRICT NUTRITION SURVEILLANCE AND PLANNING: A METHODOLOGICAL APPROACH.

4.1 Planning Process

Results of the baseline assessment and problem identification/analysis of the planning and data collection problems have been reported in the previous sections, the proposed solutions constitute the following:

- (i) a step-wise planning process ('Triple-A Cycle')², to be undertaken by a reinforced District Food and Nutrition Committee as part of a broader agenda, with maximum participation by the communities;
- (ii) development of a nutrition surveillance system that initially starts from existing information sources by a careful selection of relevant indicators and streamlining of the flow and dissemination of the information .

As we will see, the first tool of the step-wise planning process (building a hypothetical causal model on food and nutrition problems) serves a dual purpose: it facilitates the process of planning in a team, while its actual content provides the basis for rational nutrition planning.

The stages in the participatory planning approach ('Triple-A Cycle') to improve food security and nutrition among target groups in the district are:

- ∞ Baseline situation
- ∞ Causal analysis of food and nutrition problems
- ∞ Evaluation of the community resources
- ∞ Exploration of strategies for intervention
- ∞ Selection of intervention
- ∞ Planning the implementation of the intervention selected
- ∞ Monitoring and evaluation

While the first four steps are to be applied both at district-wide and at area- or group-specific levels, the planning of a specific food security and nutrition intervention requires the selection of a specific target group or geographical area, where the whole planning process has to be applied from the beginning, with participation by the beneficiaries. An approach, based on food production indicators, that would provide

² Triple-A cycle was originally used in Iringa Joint Nutrition Support Programme (JNSP) and reflects the steps in Nutrition Planning which consist of Assessment, Analysis and Action, hence the 3A's

the DFNC with a basis for such targeting is proposed. In the meantime, the nutrition surveillance system will progressively make available a wider array of baseline information, which will be fed into the planning process for review ('surveillance') purposes .

The stages of the participatory activities are described in the following sections; they have been enriched with more details on the scope of the district nutrition surveillance and planning exercise and on the various methodologies, as they have been worked out under the twin projects FNSP 16 and 20.

4.1.2. Hypothetical Causal Model for the Analysis of the Causes of Malnutrition

A hypothetical causal model or hypothetical conceptual framework can be defined as a set of hypotheses, organized and linked to each other, about the causal factors of the situation and the mechanisms that lead to it. It helps a consensus to be reached between all parties in the assessment/planning exercise, about the causes of the initial situation in the population group that has been selected as the target group of the project or programme (IMT,1991). The hypothetical causal model is also referred to as a 'problem tree'.

The hypothetical causal model will form the central tool around which the initial part of the planning of projects/programmes will be organized (i.e. the stages of assessment and analysis - see below). The methodology being applied takes into account the nutrition -planning problems enumerated earlier, in particular, it is designed to counteract the inaccurate identification of the most important nutrition problems and a disjointed analysis. Besides, it fosters collaboration between different sectors by virtue of its visualization of each other's role in the solution of the problem.

The need for the construction of a causal model (conceptual framework) comes as a result of the necessity to look at causes of food and nutrition problems comprehensively. This is necessary because there is a need to analyse step by step the causes to avoid rushing into solutions. It also allows the analysis of the causes to be looked at comprehensively, and forms the basis for choosing relevant selective interventions. The triple A-cycle consisting of Assessment of the nutritional problem, Analysis of the problem and Action to be taken has been advocated in the planning and implementation of programmes by the community, Government and other sectors, with a view to strengthening community participation at the grassroot level. The concepts of both the overall triple-A cycle and the causal model, which forms part of it can be explained as follows: The triple 'A' cycle approach (see section 4.1) summarizes the

stages followed in nutrition planning sequence. The three A's which represent the planning sequence consist of Assessment of nutritional problem, Analysis of the nutritional problem and Action plan to alleviate the problem. The Three A's can be explained as follows:

At the Assessment stage, facts about four W's are clarified:

- ◆ W1-stands for What is the nutritional problem? (The problem / magnitude)
- ◆ W2-Who is affected by this problem, i.e. any specific age or biological or socio-economic group (Population at risk)
- ◆ W3-Where does the problem occur; any specific areas? Locations, Agro-ecological zones? (Distribution within the population)
- ◆ W4-When does the problem occur? Is there a trend? Is it seasonal? (Frequency or chronicity of the problem)

Most part of this step consists of straight forward collection of data already available or easily obtainable hard data through a variety of established techniques. The information required and their sources are listed in section 4.1.3.

At the Analysis stage, the Why (causality) question is answered. From this, corrective actions may be identified. In trying to answer the Why question in relation to the What-Who-When-Where questions, developing a hypothetical causal model (conceptual framework) is made use of (see lessons learnt).

At the Action stage, the corrective interventions are identified, formulated and implemented (see selection of interventions). Monitoring during the implementation and re-assessment ('evaluation') of nutritional outcomes will lead into a new iteration of the Triple-A-cycle. This completes the nutrition planning process.

4.1.3. Information Needs for Food and Nutrition Project Planning

When planning for projects at the community level, it is important to know what resources are available at the community. The following information are important:

1. Information about People (Human Resources)

Population surveys

Medical information

Nutrition status surveys

Food consumption surveys

Cultural information

2. Information about Local Resources (Non-Human Resources)

Food production
Market surveys
Food storage
Agricultural supplies
Local programs and services
Possible sources of Funds

4.1.4 Food Security and Nutrition Planning at Divisional Level

Initial assessment of nutrition situation revealed that the major factors that cause protein-energy malnutrition among the underfives in Kilifi district are related to food insecurity and health problems. The DFNC therefore proposed that the planning should initially lay more emphasis on food security than on the health aspect. This is because malnutrition in the district is seen to be associated more to food insecurity than with morbidity.

The methodology being developed will therefore lay more emphasis initially on planning for food security at the community level. Selected surveillance data currently being collected by the Ministry of Agriculture will be used to check for food self-sufficiency at the community level.

The steps to be followed will include:

- a) Estimation of community food needs (in terms of proteins and energy)
- b) Food production estimates
- c) Identification of particularly food insecure areas.

Steps a-c will be done for divisional level first. After selection of division(s) for priority action, steps a-c may be repeated at subdivisinal and locational level. Step a. requires demographic information by area. The data needs for the estimation of the food production at the community level will be provided by the Ministry of Agriculture through the nutrition surveillance system (FNSP 20).

d) Crop pattern and expected energy and protein returns per hectare:

Local estimates for the productivity per hectare for different cropping patterns (e.g. maize; maize and cowpeas; cowpeas only...) will be produced. These will be converted into their corresponding nutritional value (energy and protein).

e) Development of alternative food production plans:

As a training tool for the extension workers who will be involved in the particular community food and nutrition planning project(s) to be undertaken at local level, exercises will be done on alternative food production plans for a model family and for a community, to sensitize them on the link between food production and nutrition. These alternative food production plans will take account of the productivity figures per hectare (see step d). However, the actual advice to be given to the community or to individual households will also have to depend on other considerations (i.e. the whole range of their livelihood resource base). The methodology on alternative food production planning borrows from experience of Tanzanian village food production planning by the Tanzania Food and Nutrition Centre (Johnson, Shagude & Sutta, 1981). The food production model will be formulated with the following conditions in mind:

- ⇒ It should be simple enough to be used by the District Food and Nutrition committee;
- ⇒ It should reflect the governments' policy of self-sufficiency in staple foods.

Step a: Estimation of Community Food Needs

The estimation of the community food needs (be it at divisional, subdivisioanal, locational or village level) is based on the demographic composition. The 'population pyramid' will, for practical purposes, be categorized into six major population groups:

- ◆ Men aged 15-59 & 60+ years
- ◆ Women aged 15-59 & 60+ years
- ◆ Children aged 0-5 & 6-14 years

Protein-energy malnutrition has been identified as the major nutritional problem in the district. Our concern is therefore to first estimate the adequate amount of energy that is required for the above population groups, using the estimated energy requirements (also referred to as 'recommended daily intakes'-RDA) according to FAO/WHO/UNU (1985) . As it is generally held that most diets will provide enough protein, as long as energy requirements are met, the RDA for protein will be based on the finding that most practical diets contain between 10-12% of the energy in the form of protein (Perissé, 1968). This calculation contains an ample margin compared to the minimum physiological requirements in terms of reference protein; this margin is expected to cater for the lower digestibility and lower protein quality (amino-acid pattern) of many dietary proteins (esp. those from plant origin) and also for inter-individual variation in actual intakes.

The annual aggregate needs of the community for energy and proteins are then calculated for the above population groups. The estimates are measured in terms of gigajoules (GJ) and kilograms (kg) respectively .

Step b: Food Production Estimates

The food production figures realized in the district disaggregated by division will be converted into the corresponding amounts of energy and protein with the help of food composition tables. These results will be compared with the estimated requirements (see step a) to provide the percentage food self-sufficiency of the division. Although no food consumption survey has been done to know the consumption pattern, the crops considered here have been discussed and agreed upon as the most commonly eaten foods in the District.

Step c: Identification of Particularly Food Insecure Areas

The above methodology will assist the DFNC in identifying the communities with a low level of food self-sufficiency. While this in itself is not the same as food insecurity (because food purchases and transfers are not included) it is assumed that a very low value for food self-sufficiency reflects a low degree of diversity in resource base composition, which entails a higher vulnerability to food insecurity. The food self-sufficiency ratio will be used as one of several important criteria to select vulnerable areas, the other ones being nutritional status among underfives and morbidity. A typology may be constructed based on how a community scores on these various criteria. It is proposed, that the first communities to be selected are in any case low in food self-sufficiency and low in nutritional status, so that the problem is most likely to be one of food insecurity. In a later stage, the DFNC may wish to select areas which exhibit a different profile, such as low nutritional status with reasonable food self-sufficiency.

After selecting priority areas, steps a-c may be repeated to select the most vulnerable locations/villages within them. In those priority areas, the committee will then go through the triple 'A' cycle approach to define 'WHO' is expected to be food deficit, 'WHERE they are' (household within the community), and 'WHEN' they expect the problem to occur. The committee will then ask 'WHY' the problem is expected to occur (by using the causal model) and recommend corrective interventions. The District Development Committee will be informed in good time if food deficit is expected.

Step d: Crop Pattern and Expected Energy and Protein Returns per hectare

According to the current development plan (DDP 1994-96), the main food crop grown in the district is maize. Other food crops include sorghum, rice, cowpeas, green grams, beans, cassava, sweet potatoes and groundnuts.

Maize, Cowpeas, Millet/Sorghum and cassava have been considered initially for our experiment. Inclusion of the other crops will be considered later. The estimation of the total acreage ploughed per household/community and expected crop yield have been provided by the Ministry of Agriculture through the nutrition surveillance system. The expected yield of the various crop patterns locally (see step d) are in Tonnes per hectare (T/ha). This applies to both mono and multi-crop pattern .

Step e: Development of Alternative Food Production Plans

This exercise (for training purposes) involves finding the best combination of crops that would maximize energy and protein output for a given area, and/or to increase the acreage planted, to achieve a given output to satisfy the requirements (step a) at a given degree of food self-sufficiency. See chapter on lessons learnt for an example based on the data from Kaloleni division (steps d-e).

Methods have been developed for doing this, however, these are complicated and needs a lot of mathematical manipulations. An iteration method will therefore be used initially to find the best combination of crops that would give a given output. At a later stage, the possibility of using a linear programming may be exploited. The methodology will assist in linking the required food needs and the expected/-alternative food production. This exercise will also assist in focusing on appropriate interventions for solving the food insecurity problem (see section 5.3).

4.1.5 Linkage of Data to Decision Making

The relationship between Planning and Surveillance is best represented in Figure 2, which shows how the two processes are linked to one another. The Planning side, through DFNC, or DHMT or Agricultural office demands data from the surveillance on a continuous basis. The information is provided through the nutrition bulletin which comes out quarterly. The District Food and Nutrition Committee or the Agricultural Office or the District Health Management Team will be demanding data related to Food security Indicators, Health Indicators and Nutritional Indicators or any other data as they may deem necessary. Once Data has been processed , analysed and Interpreted, and nutritional problems are identified, the divisions will be ranked in

terms of the major nutritional problem identified. Analysis of the causes of the nutritional problem through the causal model will then take place. At this stage, it is not necessary for the team to confirm the validity of the relationships between nutrition and other factors through statistical analysis. The DFNC will then make recommendations of what actions to take based on the findings using causal model . The recommendations can be looked at from two levels: The various sectors represented at the DFNC can take up the recommendations at their own levels and discuss them in their planning units on how best to implement it through actions (short term or medium term or long term) or the DFNC can take up the recommendations to the District Development Committee(DDC) through the District Development Officer for discussions and further action. The action taken can either be short term or long term depending on the decision of the DDC . The decision of the DDC may be implemented by the various sectors .

District Surveillance And Planning Apparatus

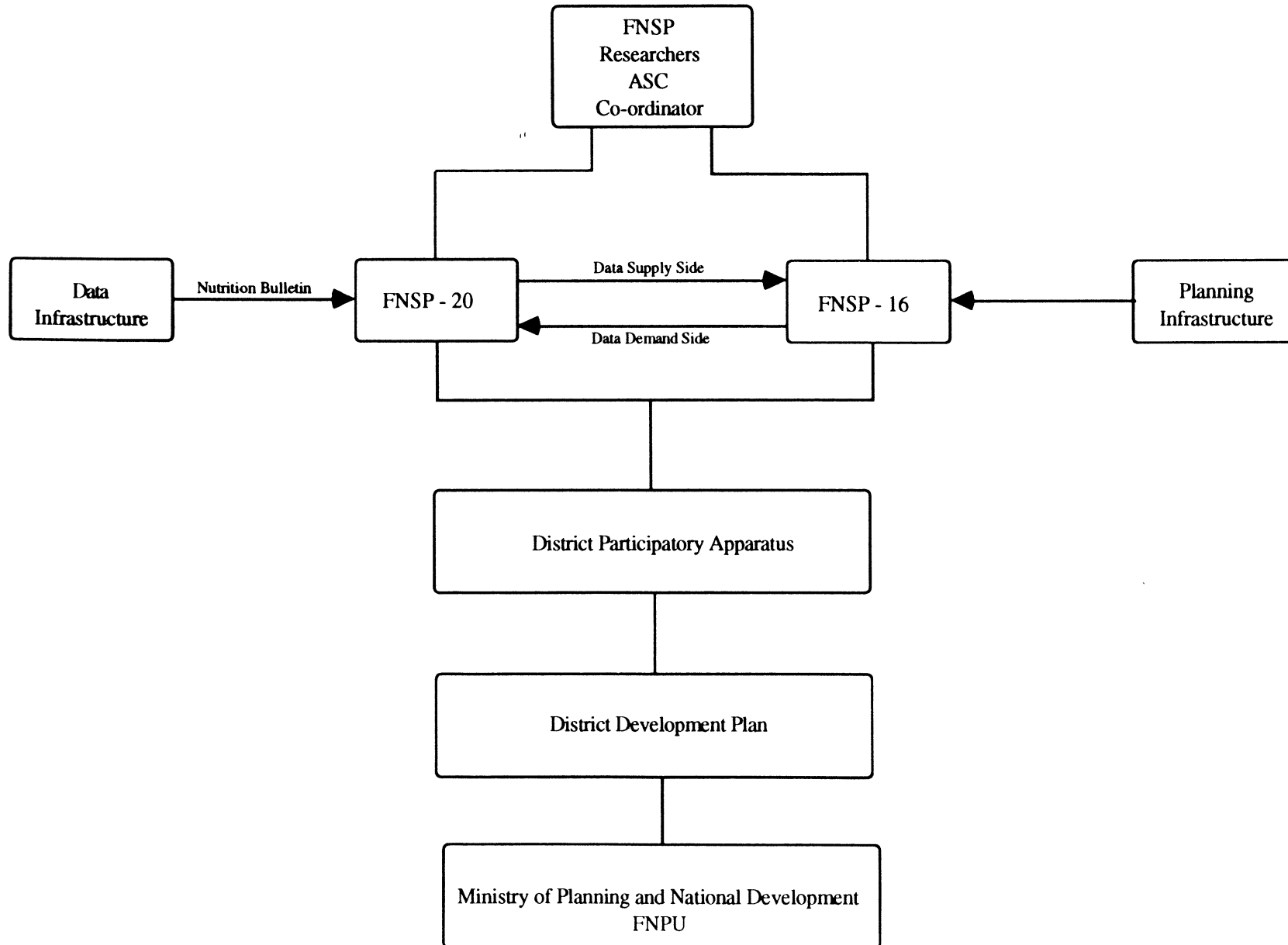


Figure 2. Planning Infrastructure

4.2 The Surveillance System

4.2.1 The Proposed System

Malnutrition³ is an outcome of complex underlying problems that can be traced to a variety of factors clustered into food insecurity, inadequate caring capacity and poor health status. In Kilifi, the underlying causes of revolve around these factors and include seasonal food insecurity, due to poor agricultural practices, high food prices, environmental factors and diseases (GOK 1994). This means that the data collection system will obtain information for analysing the food supply : a function of food production, and the health status which is a function of disease, environmental factors and utilization of health services.

Our working definition for the surveillance system is, a continuous collection and analysis of food security and nutrition indicators in order to make decisions leading to improvement in nutritional status of the Kilifi population. It will be for short and long term nutrition planning, incorporating elements of problem identification for advocacy and early warning for food security (WHO 1976, Mason et al. 1984, Habicht et al. 1990, ICN 1992) and will be embedded in the district nutrition planning infrastructure with the following aims:

- ⇒ monitor nutritional status and factors associated (agricultural, health and socio-economic) so as to facilitate identification of trends.
- ⇒ provide a continuous flow of information for decision making.
- ⇒ provide information at subdistrict level for advocacy.
- ⇒ provide information for sensitization
- ⇒ produce a quarterly nutrition surveillance bulletin for intersectoral use.

The surveillance system places emphasis on the use of existing structures for data collection, analysis and translation of information into appropriate interventions. It makes selective use of data from health, agriculture and other sectors currently being collected by various departments in selecting indicators to monitor risk factors affecting the population, describe the components and the relationships in the factors causing malnutrition using a causal model, explain the outcomes in terms of the chains in the model, predict the direction of change, detect areas of high risk and recommend actions and interventions.

³ Malnutrition here refers to undernutrition

4.2.2 Indicator Selection for Surveillance and Planning.

Since lack of monitoring and evaluation and disjointed analysis were identified as the major constraints to nutrition planning in the district, indicators for monitoring in the surveillance system are selected from multisectorally developed causal model through a participatory process. This has a aim of establishing a regular, joint monitoring and review system since solving problems of malnutrition is not the responsibility of any one ministry but requires concerted efforts and data from several sources.

Working selection takes into account the following;

- (i) that the existing institutional framework currently generates, processes, analyses data that can be used to generate basic information;
- (ii) that the data are easy to extract from the current institutional data instruments, because in this system, no new primary data will be collected unless the data gap(s) are a constraint to planning;
- (iii) that the data can be used to locate vulnerable areas or groups in terms of food and nutrition.

The selection borrows from the experiences by Haddad et al. (1992) in their empirical analysis of data from seven countries where they found that simple indicators can be used to identify areas or groups that are insecure in terms of food and nutrition.

4.3 Structures for Surveillance and Planning

4.3.1 The Planning Process.

As a result of the problems currently being experienced by the DNC, It was agreed that the membership and mandate of the present DNC be expanded. This committee will take into consideration those problems. The committee will be called District Food and Nutrition Committee (DFNC). Membership of the committee will consist of the following multi-sectoral group.

District Commissioner	- Office of the President
District Development Officer (to be chairman)	- OVP & MPND
District Statistical Officer	- OVP & MPND
District Paediatrician	- Ministry of Health
District Nutritionist	- Ministry of Health
Health Education Officer	- Ministry of Health

Medical Records Officer	- Ministry of Health
Home Economist	- Ministry of Agriculture
Farm Management Officer	- Ministry of Agriculture
Marketing Officer	- Ministry of Agriculture
Crops Officer	- Ministry of Agriculture
Livestock Officer	- Ministry of Agriculture
District Social Development Officer	- Ministry of Culture & Soc. Serv.
Supervisor-FLTC services	- Ministry of Culture & Soc. Serv.
Education Officer (Projects)	- Ministry of Education
Operation/Maintenance Officer	- Ministry of Water
Information Officer	- Ministry of Information
Co-ordinator - Kilifi District	- Coast Development Authority

* NGO's to be decided on.

The main broad objectives of the DFNC will be to reduce the stunting rates⁴ from 39% to 22% during the current plan period, through the following activities:

- Analysis and presentation of food and nutrition data
- Using the surveillance data for multisectoral review and discussion and advocacy
- Sensitizing the DDC and the community on food and nutrition issues
- Monitoring the impact of nutrition oriented activities
- Enhancing a bottom-up approach to food and nutrition planning
- Enhancing inter-sectoral collaboration as a strategy to increasing the effectiveness of food and nutrition activities in the district (by joint analysis and by well-coordinated implementation)
- Exploring areas of improving dietary intake of the community
- Writing proposals on nutrition projects and solicit funds, personnel and materials
- Developing a food and nutrition bulletin
- Writing up the nutrition chapter of the District Development Plan

A proposed framework for the agenda of the DFNC, that would incorporate both comprehensive (district-wide; entity-wide) and selective (sectoral; targeted) considerations, and that includes the above activities, is as follows:

- Promoting intersectoral collaboration.
Intersectoral collaboration is more than sharing materials or facilities; it is working together to achieve a common shared goal based on agreed concepts. The common goal should be to break the vicious circle of malnutrition and undernutrition. It has

⁴ See note 3 in section 2.3

to be remembered that single sectors may take care of relevant conditions that are necessary (example: food availability), but in themselves not sufficient to solve the nutritional problems (e.g. because 'care' and 'biological utilization' should also be adequate).

- Continuous review of the food security and nutrition situation in the district on the basis of information to be provided by the surveillance infrastructure through its bulletin: **Assessing and Monitoring Nutrition Situations**.

The entity to be addressed ('nutrition security') can be broken down in two groups of areas, the broad types of nutrition problems per se and the main underlying problems:

Broad types of nutrition problems:

- Inadequate food supply
- Endemic undernutrition/malnutrition
- Micronutrient deficiencies
- Non-communicable chronic diseases

Main underlying problem areas:

- Household food insecurity
- Insufficient food quality and safety
- Infectious diseases
- Inadequate caring capacity

- Exploring and widening of the available 'action-decision space'.

It is proposed that the planning process will not only generate activities which conventionally are formulated as projects, but that a wider array of possible strategies will be explored. Examples are: enforcement of national policies and regulations in the district (e.g. related to food safety control, to marketing, to maternity leave and rest), public information campaigns, advocacy/lobbying activities to influence decision makers, programmes (e.g. Baby Friendly Hospital Initiative, safety nets for the low-income groups, or programmes for the stimulation of participatory development by NGO's and the private sector). The final target groups for activities are individuals and households in the communities; however, intermediary actors can also be targeted for action, such as professional staff in various service organizations (e.g. teachers, trainers, extension workers, health staff), administrative leaders at sub-district level , etcetera. Apart from developing specific food security and nutrition activities, the strategy of introducing nutrition considerations into other development programmes may have to be explored. In the same vein, general policies could be checked on their 'nutrition-friendliness', i.e. the extent to which the nutritional situation of certain

(even non-intended) vulnerable groups is at least not jeopardized, and preferably improved.

- Developing strategies and preparing decisions (i.e. developing proposals) for interventions at district level and at community level.
- Division of tasks

While awaiting more comprehensive nutrition information to be forthcoming, a start will be made with disaggregated food production assessment, which, while contributing to the continuous review at district level (see above), will also be used to select target area(s) for initiating participatory food security and nutrition planning at community level.

4.3.2. Data Management

The components of the surveillance system and its mechanisms are presented in this section. The system will be made up of the following: data capture and flow, data analysis and interpretation.

Data Capture Instruments

New formats for data capture developed to conform with the current data collection instruments will be completed in addition to the existing data formats. The purpose of these instruments is to extract only data for monitoring food security and nutrition indicators selected from the causal model so that the surveillance system forms the supply side of the demands of the planning for solving nutritional problems in the district. The main data sources are the agricultural and health information systems with data flow using the existing channels. Initially, the indicators will be extracted for all division and later, for selected SENTINEL AREAS. The selection of these areas is based on vulnerability in terms of food and nutrition, agro-ecological zones and where high coverage of communities is likely. These sentinel areas will not necessarily represent a true sample but will provide initial coverage to establish an information network. It is envisaged that more sentinel areas will be added when the system becomes fully operational.

Data Extraction and Processing

The data capture instruments (see Annexes 4-12) developed for the surveillance system will be used by the statistics units in each ministry to extract data at locational level by the agricultural extension workers and health facility workers. Qualitative data will also be recorded if they shall prove useful in data analysis and interpretation. The officers who will be responsible for data processing and interpretation are shown in Table 1. In general, these activities fall under the overall responsibility of the designated officers.

At the initial stages, data processing will be done manually using hand calculators and data outputs will provide descriptive statistics namely; frequency and percentage distributions of the indicators disaggregated by division. Some of these statistics are currently provided in the form of frequency distributions with no further analysis.

Software will be installed in the computer, specifically allocated to the District Food and Nutrition Committee (DFNC), in the Central Bureau of Statistics (CBS) office for processing and analysis of the sectoral data. Officers in the statistics unit of Health and Agriculture CBS will be trained on the manipulation of this software at the implementation stage.

Data Storage:

The current storage systems, that is, filing of data capture instruments in the sectors by activity, for example outpatient morbidity tally sheets in the Medical Records Office, will be used prior to the installation of the computer in the CBS office. The CBS office will be the central office where all data from the sectors will be stored and analyzed. The data are property of the government and shall only be retrieved for Core Committee meetings and disseminated in the Kilifi District Food and Nutrition Bulletin. Any specific request for retrieval of data shall be formally communicated to the District Commissioner for authority.

Table 1: Officers Responsible for Data Capture and Ministry.

MINISTRY	OFFICER RESPONSIBLE	VARIABLE
AGRICULTURE	Crop Production Officer	<ul style="list-style-type: none"> * Rainfall. * Pest Infestation. * Hectares Ploughed. * Hectares Planted. * Crop Situation. * Yields Realized. * Food Situation
	Farm Management Officer	<ul style="list-style-type: none"> * Use of Fertilizers. * Seeds. * Farm Machinery availability.
	Marketing Officer	<ul style="list-style-type: none"> * Market Prices. * Market Outlets.
	Horticultural Officer	<ul style="list-style-type: none"> * Food Availability.
HEALTH	Medical Records Officer (MRO)	<u>Diseases: New Cases</u> <ul style="list-style-type: none"> * Malaria * Diarrhoea * Anaemia * Intestinal Worms * No. of New Cases * No. of Reattendance * Immunization Status.
	MRO/ Nutrition Officer/ Statistics Officer (DSO)	<ul style="list-style-type: none"> * Nutritional Status.
CULTURE & SOCIAL SERVICES	Supervisor, FLTC	<ul style="list-style-type: none"> * Malnutrition rehabilitation admissions
EDUCATION	Projects Officer	<ul style="list-style-type: none"> * Pre-school nutritional status
WATER	Water Officer	<ul style="list-style-type: none"> * Water Quality.

Data Analysis and Interpretation

Each institution will form sub-committees where data analysed by the statistics units will be presented for interpretation. The sectoral subcommittees consist of the following:

I). Ministry of Health:

- District Medical Officer of Health (Chairman)
- District Hospital Paediatrician
- District Health Education Officer
- District Public Health Officer
- District Public Health Nurse
- District Medical Records Officer
- District Nutrition Officer

II). Ministry of Agriculture:

- District Agricultural Officer (Chairman)
- District Livestock Production Officer
- District Home Economics Officer
- District Marketing Officer
- District Crops Officer
- District Farm Management Officer

III). Ministry of Planning and National Development:

- District Statistical Officer (Data Collection Advisor)

IV). Ministry of Culture and Social Services:

- District Social Development Officer (Chairman)
- FLTC Supervisor

V). Ministry of Education:

- District Education Officer- Project (Chairman)
- DICECE - Programme Officer

VI) Ministry of Land Reclamation and Water Development:

- District Water Officer (Chairman).
- Water Officer - Operations and Maintenance
- Laboratory Technician

Data interpretation will be carried out at the Sub-Committee and Core-Committee level.

Sub-Committee Level (Sectoral):

The sub-committees will carry out preliminary interpretation of data at departmental level using the causal model to guide the analyses of the underlying causes of malnutrition. The analyses are expected to be basic, that is, not requiring any rigorous statistical tests since the analytical capabilities are currently not available at the district. Ministry of Agriculture will describe data using the Food Intake Chain (see Figure 3) while the Ministry of Health will use the Food Utilization Chain of the causal model. Standardized formats for interpretations will be developed for each sector and will include brief explanation on the trends of the indicators in the quarter under review, where possible the causes of such trends and priority actions on indicators showing signs of distress. The outcomes of these interpretations will form the basis for the Core-Committee meetings, however, the information can also be used at sectoral level to take priority actions.

Core-Committee Level (Multisectoral):

The Core-Committee draw members from the various sub-committees and also makes up the DFNC. Through its objectives as stated elsewhere in the report (see section 4.3), the DFNC is the overall food and nutrition co-ordinating group. Below are the members of the Core committee.

Office of the President:

District Commissioner (Chairman of DFNC).

Ministry of Health.

- District Medical Officer of Health
- District Hospital Paediatrician
- District Health Education Officer
- District Medical Records Officer
- District Nutrition Officer

Ministry of Agriculture, Livestock Development and Marketing.

- District Agricultural Officer
- District Livestock Production Officer
- District Home Economics Officer
- District Marketing Officer
- Crops Officer

Ministry of Culture and Social Services.

District Social Development Officer
Supervisor, FLTC

Ministry of Planning and National Development.

District Statistical Officer

Ministry of Education.

District Education Officer

Ministry of Land Reclamation, Regional and Water Development.

District Water Officer

Ministry of Information and Broadcasting.

District Information Officer

Coast Development Authority.

Co-ordinator, Kilifi District

Non-Governmental Organizations.

Kenya Agricultural Research Institute
Kenya Medical Research Institute
Kenya Freedom From Hunger Council
African Medical Research Foundation
Red Cross

The Core-Committee meetings will take place once every four months under the chairmanship of the District Commissioner (DC). During the meetings, the sectoral sub-committees will present the interpreted information. The meeting will examine the outcome of the indicators, draw conclusions and give recommendations for interventions. The Secretary to the meeting will compile the information in the proposed Kilifi Food and Nutrition Bulletin.

Reporting:

Reporting of the data analysis and interpretation will be in the form of the **Kilifi District Food and Nutrition Bulletin**. This is a quarterly report that will serve various purposes:

- (i) continuous review by the DFNC on the food security and nutrition situation and trends in the district ('surveillance' proper), which should be linked to action (development of strategies and interventions at district level and at community level)

- (ii) ranking of the divisions in terms of nutrient needs of the population against the food produced, nutritional status and morbidity. This will assist in prioritization of the division most in need.
- (iii) awareness raising and advocacy among decision makers at the District Development Committee.
- (iv) providing information that should be used to integrate nutrition considerations in the various sectoral chapters of the District Development Plan.

Apart from producing the bulletin, the nutrition surveillance system will also provide tailor-made information support for the community nutrition interventions that will be developed by the District Nutrition Planning Infrastructure (Project FN-SP-16).

4.4 Selection of Strategies and Interventions

The eventual decision made by the DDC or the individual sectors may end up in an intervention which can be in the form of a project. This section explains how one can go about selecting the relevant intervention given a number of criteria. The domains of intervention are those that are within the 'entity' of nutrition security. A part from intervention projects, wider strategies and programmes may have to be considered.

An intervention can be defined as an activity, project or programme which contributes to change, correction or to improvement of the root factors identified in the hypothetical causal model. It is considered specific if the major purpose is nutritional (e.g. supplementary feeding, nutrition education etc.) or non specific if it is indirectly influencing nutrition improvement (e.g. construction of toilet, installation of water system etc.) (IHN, 1991). Interventions to nutrition are usually called for when orientation of a development project towards nutrition would not yield results rapidly enough (FAO, 1983).

A number of interventions currently being implemented by the various ministries as measures to reduce malnutrition are enumerated below. These and other interventions (not listed here) can be enhanced in areas where they are being implemented or selected in areas where they are deemed relevant:

- Face-to-face nutrition communication
- On-farm and community food storage
- Primary health care

- Weaning foods
- Family planning
- Nutrition integrated into health care
- Nutrition communication via mass media
- Nutrition rehabilitation
- Supplementary feeding of pre-school children
- Supplementary feeding of pregnant and lactating mothers
- School feeding programmes
- Home & community gardens and small livestock
- Appropriate technology in food preservation & preparation
- Distribution of specific nutrients
- Promotion of breastfeeding
- Food for work
- Water and Sanitation

Identification and Selection of Interventions

In the selection of appropriate nutrition intervention, the following steps will be followed (Beghin, 1983):

1. Identification of groups affected by malnutrition , quantification of the problem and formulation of objectives
 - 1.1 Clear identification of the groups to be covered; characteristics through which they can be recognized; their numbers (see the four W's-)
 - 1.2 Clear definition of the nutritional problem among the target group
 - 1.3 Formulation of outcome objective(s)
2. Choice and ranking of the criteria to be used in selecting the most appropriate components
3. Identification of the most relevant interventions (based on the outcome objective(s) and on the analysis of the causal chains in the hypothetical causal model). The interventions considered come as a result of the analysis of the causal chains in the Hypothetical causal model. It is therefore imperative that activities or projects to be selected should be closely linked to the boxes in the causal model.

4. The choice of interventions will be done by using a "decision matrix", which entails critical discussions of relevant components by criteria (see below) resulting in a choice of priorities.
5. In-depth analysis of selected components.

In selecting the above interventions, a number of criteria to be followed have been proposed by Food and Agricultural Organization (FAO). The selection, however, depends on prevailing circumstances. The DFNC may also explore the possibility of formulating its own criteria for the selection of intervention(s).

- Relevance to the defined nutritional problem
- Feasibility (inc. acceptability & respect of cultural values)
- Integration with similar existing programmes
- Effectiveness in terms of:
 - a) Nutrition impact
 - b) Reduction of inequalities (e.g. within households)
 - c) Stimulation of participation and increased self-reliance
 - d) Strengthening of other project components
 - e) Other development effects
- Ease in targeting
- Cost-effectiveness (I/O)
- Ease in evaluation
- Likelihood in becoming a long term, ongoing programme

In building the 'decision matrix' (step 4), each criterion (agreed upon in step 2) is cross-checked by asking which intervention fits the criteria best. Grades (H, M or L) are awarded to each intervention. The decision to give the grades should be made independently from the answers on the previous lines. One, two or more interventions may be selected depending on the scores. These will be most relevant interventions under our criteria.

If an intervention being implemented already is selected, then the sector concerned should put more emphasis on that particular intervention, i.e. it should be strengthened.

4.4.1 Planning the Implementation of the Intervention

The planning of the implementation of the intervention(s) selected in the previous section will start by the construction of a 'HIPPOPOC' table (i.e. Hypothetical Input, Process, Output, Outcome table). The HIPPOPOC table can be defined as a table that describes the different components of the intervention such as INPUT (financial, human, technical resources etc.); PROCESSES (action or steps to be performed to transform INPUTS); OUTPUTS (results anticipated from the operational objectives of the project); and the OUTCOME (results from a combination of actions undertaken by the project). See ANNEX 13 for the format of the table. Its detailed construction is explained in the next section.

The second tool for the planning of the implementation is the so-called 'Dynamic Model', which is built from the hypothetical causal model and the HIPPOPOC table. The dynamic model is useful for the selection of indicators for monitoring and evaluation of the project.

Generally, it is required that a planning team should have a technical document (or project document) for each of the interventions of the project, i.e. a document that summarizes the main characteristics of the interventions before the construction of the HIPPOPOC table.

4.4.2. HIPPOPOC Table

The construction of the HIPPOPOC table consists of the following steps (IMT, 1991):

- a) The team makes a complete list of all the activities comprising the intervention, i.e. a list of the processes involved. Whether each intervention corresponds to at least one box in the causal model is then checked. If not, either the activity is irrelevant, or the causal model did omit a box and it needs to be corrected.
- b) The table can now be built. Six columns are made, with the following titles: INPUTS, PROCESSES, OUTPUT, OUTCOMES and REMARKS. To the left of the INPUT, the name of the INTERVENTION will be inserted.
- c) It is generally more convenient to fill the process column first, because the processes are known, concrete and easy to identify. Processes can be subactivities within a given activity. Alternatively, in cases where the document has to be re-constituted, the objectives expressed in terms of Outputs are likely to be known or

reconstituted more easily. In such situations, it might be more convenient to start by filling the output column in the first place.

- d) The next step is the filling of the Input column. The Inputs are grouped under broad headings such as subjects of the intervention and resources (human, technical, financial, institutional, and material). They should not be disaggregated too far, and should appear only once. The process columns are used to check whether all inputs have been considered. Cross checking and verifying whether all the possible uses of inputs have been considered (and whether no input was forgotten) will improve the table. People and/or beneficiaries are to be listed as inputs, since they can be included as resources and/or as subjects to be transformed by the process.
- e) The last step is a discussion about the Objectives, and the filling of the Output and Outcome columns

If there are more than one intervention selected, a general HIPPOPOC table constituting all the activities can be constructed first before going to specific HIPPOPOC tables. This will show us clearly how the different activities of different sectors are related to one another at the stage of dynamic model construction.

Finally, it is very important to check the relevance of the activities and/or projects selected with the original causal model. The interventions considered come as a result of the analysis of the causal chains in the hypothetical causal model. It is therefore imperative that activities or projects to be selected should be closely linked to the boxes in the causal model. If the activity in the HIPPOPOC table does not affect/respond to at least one of the boxes in the causal model, then it has no influence to the situation under consideration, and cannot be considered as relevant. In such a case it might be useful to drop the activity.

4.4.3. The Dynamic Model

This is a representation of the hypotheses that explains how the inputs are transformed (by processes) to give the expected results of the project/programme (outputs & outcomes). Outputs are the immediate results of activities (in terms of a product or a service). Outcomes refer to the effects due to the use of the outputs by a target group. The dynamic model links the project inputs to the project results through the processes. The dynamic model is built from both the HIPPOPOC table and the causal

model and its main use in the selection of indicators for monitoring and evaluation of the project.

The easiest way of constructing a dynamic model is through starting with the final outcome (the final outcome will be agreed upon by the participants).

Starting with the final outcome, linkage by arrows is established for the major sub-outcomes to the final outcome. Then the main outputs are included.

By using the causal model as the reference point, the main confounders are identified in the dynamic model. Confounders are the factors which do not act upon or control the activities, but which contribute to the outcomes. If confounding factors are identified but not present in the causal model, the latter should be updated to include these factors.

Finally, by using the HIPPOPOC table as the reference point, the main processes and inputs are included.

4.4.4 Technical Document/Operational Plan

A technical/operational plan is a fundamental tool which describes the characteristics and operation of selected interventions. It also provides the basic technical information to the project/programme leader, and the needs of the planning and evaluation team.

It is a document that explains the components of the programmes into detail (IMT, 1993). In an evaluation exercise, it helps in the construction of the HIPPOPOC table, however, in the planning of an intervention, it can be constructed after the construction of the HIPPOPOC (and the Dynamic Model). This is because at the moment of participatory planning, it cannot be exhaustively constructed due to inadequate information. It is best done by the various sectors under which particular activities fall. This is because they are the experts in that field and are therefore more familiar with the activities. The main component of the document (IMT, 1993) are:

- ◆ Title of the Intervention
- ◆ Definition of the Intervention
- ◆ Justification of relevance
- ◆ Objectives
- ◆ Target groups
- ◆ Strategies
- the sponsors
- the managers
- those who do but don't decide (e.g. extension workers etc.)

- ◆ What? The activities:
 - activities
 - resources needed
 - criteria for the selection of an intervention
 - verification; how will it work; how does this work; who does what?
- ◆ Where? Place of action.
- ◆ When? The "time" dimension:
 - starting from when?
 - for how long?
 - after how long?
 - with what? resources needed;
- ◆ Acceptability by both the implementors and target group
- ◆ Feasibility
 - definition of constraints
- ◆ Participation
 - the place of the community participation etc.
- ◆ Cost
 - the total cost of the intervention
 - its marginal cost
 - the unit price per beneficiary

One may wish to include a plan for monitoring and evaluation (refer to the selection of indicators in the Dynamic Model) and time schedule.

A simplified format of the operational plan is given in ANNEX 14.

4.5. The Role of the Community

Community involvement, as has been indicated above is very important in the planning process for sustainability . Ideally, the community should be given a chance in the identification of their needs and participate in the discussions of actions to take. The professionals, therefore, need to become aware of the contributions of the community people as a source both information and insurance for project/programme implementation. The above methodology, if used with the involvement of the community, as a means to initiate their participation in the planning process will ensure their co-operation and active participation in the project/programme implementation. This will be one way of strengthening the capacity of the community to address their health/nutrition situation. Such an approach, which provides the basis of

the nutrition strategy now promoted by UNICEF, is based on the recognition that significant human and economic resources can better be focused on the needs of women and children by increasing people's awareness and understanding of their health and nutrition situation, and by strengthening their capacity to take action (Moneti 1992)

5.0 EXPERIENCES IN THE DEVELOPMENT OF THE MODEL

The food and nutrition surveillance and planning project was initiated in May 1993 with an aim of developing an infrastructure that could be applied to district level planning and making preferential use of the existing information system of different sectors within the government. The first phase was exploratory (covering three districts namely Kakamega, Kajiado and Kilifi) and studied the constraints to nutrition planning process and problems in data management. The objective was to examine the possibilities of improving the existing institutional framework for establishing an inbuilt surveillance and planning infrastructure. Kilifi was ultimately selected as the pilot district.

The second phase consisted of workshops involving the district personnel concerned with food and nutrition issues in Kilifi. The main workshop was conducted in August 1994 and involved the setting up of the surveillance and planning infrastructure and activities during the workshop are presented below. It is worth noting that the subsequent workshops held for the district staff were mainly on institutional capacity building for the management of the infrastructure.

5.1 Nutrition Problem Identification

At main the workshop, the participants were divided into four multi-sectoral groups to work on the construction of problem trees (hypothetical causal models) based on problems identified as the major causes nutritional problems, namely:

- * Household food insecurity
- * Protein-energy malnutrition in Kilifi district and in Kaloleni division, respectively
- * Anaemia among women in Kilifi district

Identification of the Probable Causal Factors of Malnutrition

Causal factors of malnutrition in the district were identified and listed by each of the groups as shown below:

Group 1: Household Food Insecurity
(ANNEX 1)

Low food production
Poor food distribution
Lack of awareness
Poor road network
Low purchasing power

Group 2: Protein-Energy Malnutrition
(ANNEX 2)

Large family size
High illiteracy rates
Ignorance
Negligence
Starvation

Poor farming methods
Ill health
Political Influence
Land Ownership
Natural calamities

Poor eating habits
Broken families
Single parenthood
Poor harvests
Diseases
Early marriages
Lack of appropriate technology
Traditional beliefs

Group 3: Protein-Energy malnutrition in Kaloleni (ANNEX 3)

Poor weaning practices
Diarrhoea
Low resistance to disease
Heavy workload for mothers
Poor food preparation
Unsafe Water
Unhygienic practices
Lack of Knowledge
on protein/energy rich foods

Group 4: Anaemia among Women (ANNEX 4)

Inadequate intake of Iron
Inhibited Iron absorption
Iron loss
Malaria
Worm infestation
Haemorrhage
Food scarcity
Poor quality diet
Lack of community commitment

Establishment of Causal Chains

The groups, through iteration to find the logical sequences of the causes and effects by linking the identified factors by using lines. The causal models are presented in Annex 1-4. As one can see, groups 1-3 also continued to work on the specification of further development effects of the nutritional problems (upper part of their models).

Designing the Causal Model

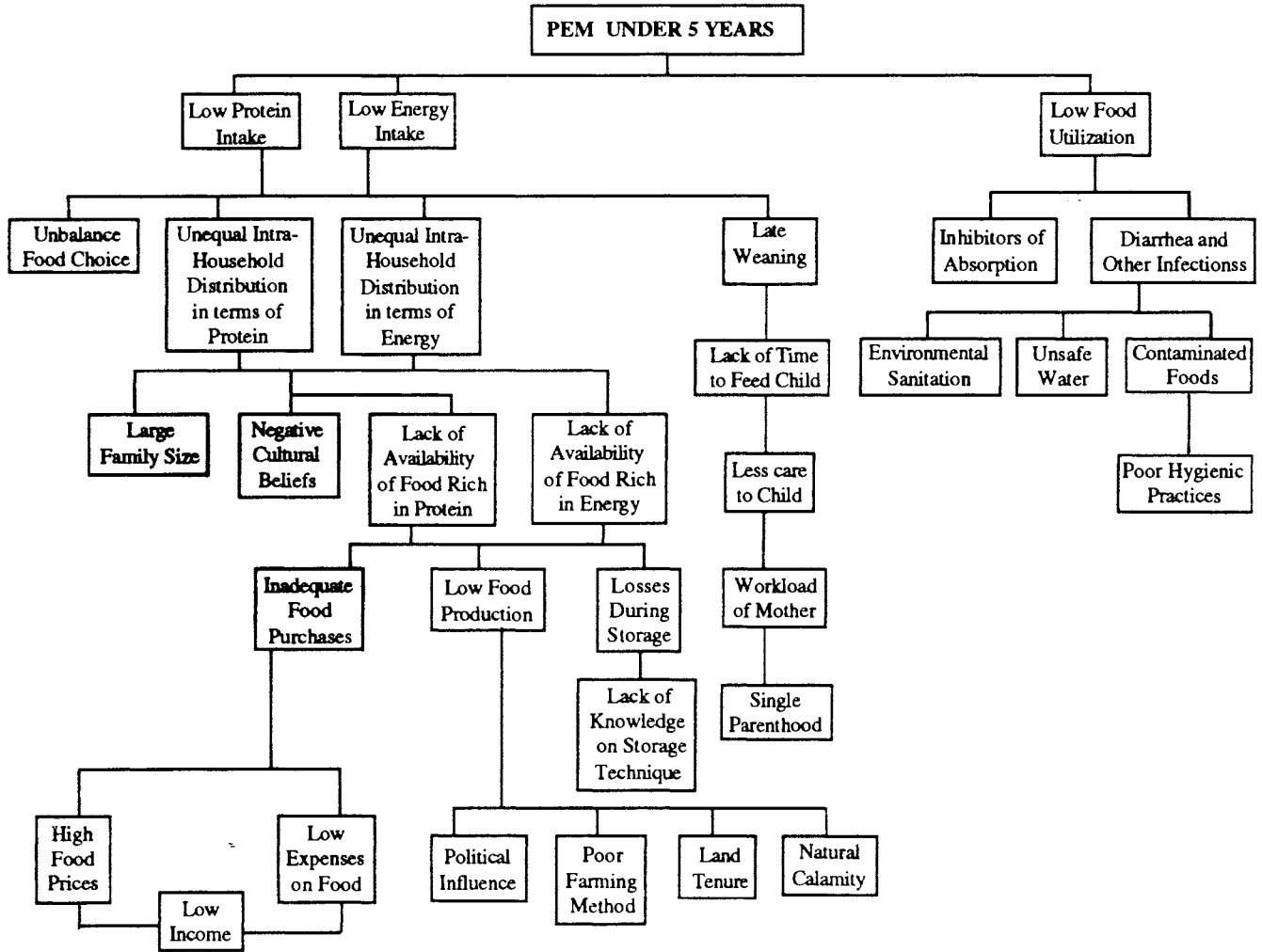
The facilitators integrated the individual models of groups 1-3 into an overall causal model for PEM. The integrated causal model is presented in Figure 3. It has been emphasized elsewhere that the planning methodology being used here is participatory. The beneficiaries are therefore supposed to participate in the planning process. In this case, however, the community was not represented during the construction of the hypothetical causal model, although the extension workers who work closely with the communities were present. It is, however, anticipated that before designing any intervention, the key informants will be consulted to ascertain that the causal model is a true representation of the situation at the local level. If not, a revised model will have to be built.

Earlier on , the participants worked (according to sectors) on the nutritional planning problems/constraints. Both exercises proved to be an eye opener for the participants, as they saw clearly the causal relationships between the factors at different levels (immediate, underlying and more basic causes).

5.1.1 Lessons Learnt from Intersectoral Causal Model Building:

- The causal model assists in tracing the root causes of malnutrition, i.e. in studying the dynamics of malnutrition.
- The causal model (causal model) facilitates communication between different sectors, as the participants from the various sectors come together to discuss the causal factors of malnutrition and to make them explicit using a visualization technique (coloured cards, posters).
- The linkages between the various sectors become clearer.
- The model can be used in the selection of indicators for food and nutrition surveillance and is part of the 'dynamic model' which is used to select indicators for project implementation and monitoring).

Figure 3. Integrated Causal Model



5.2 . Indicator Selection for Food and Nutrition Surveillance.

The selection of indicators of food security, health and nutrition was an outcome of the participatory activity involving all the sectors involved in food and nutrition. The working indicators were derived from causal model and were later defined in terms of source of data, the variable for calculating indicator, level of collection, frequency of collection and level of aggregation. The main indicators selected are classified below:

1. Food Security Indicators.

1.1 Indicators related to Agricultural Potential

- a) Rainfall
- b) Agro-ecological zone
- c) Pest Infestation

1.2 Food Production

- a) Acreage Ploughed
- b) Acreage Planted
- c) Crop Situation
- d) Yields Realized

1.2.1 Agricultural Inputs

- a) Fertilizer Use and Variety Trials
- b) Availability of Seeds
- c) Farm Machinery Available

1.3 Food Prices

- a) Market Prices
- b) Food Situation
- c) Market Outlets

1.4 Incomes

- a) Agricultural Sales

2. Health Indicators

2.1 New Cases of Diseases

- a) Malaria
- b) Diarrhoeal Diseases
- c) Anaemia
- d) Intestinal Worms
- e) Diseases of Respiratory System

- g) AIDS/HIV (proposed)
- h) No. of new cases

2.2 Outpatient Reattendances

2.3 Other Health related Indicators

- a) Immunization

3. **Nutritional Status Indicators.**

- a) Weight-for-Age (CHANIS)
- b) Incidence of Marasmus/Kwashiorkor (FLTC)
- c) Height-for-Age (periodic household surveys)

5.3. **Analysis and Interpretation of Food Security, Health and Nutrition Data: Kilifi District Food and Nutrition Bulletin.**

The analyses based on retrospective data collected by the district personnel involved in the development of this methodology are presented in the Kilifi District Food and Nutrition Bulletin (Annex 15). Data from the agricultural and health information systems extracted using the initial versions of data formats developed when the indicators were selected. The Bulletin shows how the data by individual ministries have been collated to improve on information for decision making and multi-sectoral use.

5.3.1. **Planning for Food Security**

In the calculation of food requirement and food gap for the various divisions, two indicators of food production namely, hectares targeted and yields realized and the population distributions have been used. The calculations have eventually been used to classify divisions that are vulnerable in terms of food security and to predict, using other indicators such as nutritional status (see Annex15).

Divisional Food Requirement Calculations.

The estimations of the community food needs have been calculated for the divisional level. This has, first been done by projecting the population of the various age groups namely:

- Men aged 15-59 & 60+ years
- Women aged 15-59 & 60+ years
- Children aged 0-5 & 6-14 years

The exponential population growth rates formula has been used for the estimation of the population.

$$P_{n+t} = P_n \text{ exponential } rt$$

where P_n =base population (given)

P_{n+t} =value of P_n after t years

t =duration (Intercensal period) in years

r =exponential rate of growth

where $r=1/t \ln(P_{1989}/P_{1979})$

The caloric and protein food requirements have been calculated based on the above population groups. The population considered are for the years 1992-94. This has been done in order to identify the divisions that have been food deficit in terms of food production self-sufficiency.

Our concern is, first to estimate the adequate Energy-Protein required for the above population groups, using the estimated energy requirements (also referred to as 'recommended daily intake' - RDA - using ECSA⁵ tables). These calculations have been calculated for the ordinary worker.

The energy required is got by multiplying 'a factor' to number of individuals in the population group. The factor is calculated as:

Number of days in a year * caloric need for the age group per day / 1000000 (GJ).

The units for energy are expressed in Joules, however, since we are dealing with a large population, Giga-joules will be used (1 Giga-joule= 10^{*9} joules). The same formula is used for protein calculation, however, the units are in Kilograms (Kg). An illustration has been put for Ganze division for the year 1993.

⁵ ECSA refers to food composition tables for East, Central and Southern African region.

Table L1. Divisional caloric and proteins requirements (1992)

Population Group	Number in Division		Annual Energy Needs (Gj)
Children (0-5yrs)	22,642	*2	45,284
Males (6-14 yrs)	12,550	*3.3	41,415
Females(6-14yrs)	13,420	*2.9	38,918
Males (15-59 yrs)	19,367	*4.4	85,215
Females (15-59 yrs)	27,435	*3.3	90,536
Males 60+ yrs	2,438	*3.7	9,021
Females 60+yrs	2,445	*3.0	7,335
TOTAL	100,297		317,724

By using the Divisional crop production statistics for the year 1992-94, the amount of calorie and proteins obtained from food produced for the major crops viz: Maize, Millet/Sorghum, Cassava and Cowpeas and have been calculated by the use of food composition tables (ECSA). The figures calculated are then expressed as a percentage of the recommended daily allowance (RDA) for the population to find the nutrient shortfall or surplus.

Table L2. Divisional caloric and protein needs (1992)

Division	Population	Caloric req.	Protein req.
Ganze	94,892	300,884	1,216,548
Kaloleni	210,849	668,753	2,685,860
Bahari	133,478	420,320	1,704,909
Magarini	79,658	253,095	1,015,540
Malindi	124,389	397,267	1,588,510

Table L3. Divisional caloric and protein requirements (1993)

Division	Population	Caloric req.	Protein req.
Ganze	100,297	317,724	1,278,639
Kaloleni	217,560	671,936	2,770,818
Bahari	137,622	439,015	1,047,854
Magarini	82,193	261,148	1,757,783
Malindi	128,101	409,415	1,209,083

Table L4. Divisional caloric and protein requirements (1994)

Division	Population	Caloric req.	Protein req.
Ganze	102,676	325,139	1,306,943
Kaloleni	224,651	786,583	3,065,315
Bahari	141,866	453,002	1,815,664
Magarini	84,872	269,661	1,082,007
Malindi	132,274	422,758	1,690,982

Table L5. Caloric/Energy from food Production 1992-94 (Units are in Giga Joules)

Division	Year		
	1992	1993	1994
Ganze	372,829	421,056	155,131
Bahari	370,479	563,551	137,930
Kaloleni	267,250	-----	257,079
Malindi	110,113	83,948	85,672
Magarini	135,919	-----	109,072

Table L.6. Percentage of energy requirements met from food production.

Division	Year		
	1992	1993	1994
Ganze	124	133	48
Bahari	88	128	30
Kaloleni	40	----	32
Malindi	28	20	20
Magarini	54	----	40

The calculations have also been done for proteins as listed in the following tables.

Table L7. Protein production (1992-1994) in Kg

Division	Year		
	1992	1993	1994
Ganze	1,498,776	1,026,913	1,045,908
Bahari	4,255,841	1,613,673	1,125,250
Kaloleni	848,010	----	674,271
Malindi	762,009	299,274	266,642
Magarini	496,570	-----	380,077

Table L8. Percentage of protein requirements met from food production

Division	Year		
	1992	1993	1994
Ganze	123	80	80
Bahari	249	92	62
Kaloleni	32	---	22
Malindi	48	25	16
Magarini	49	---	35

In the calculation of the amount of calorie and protein obtained from food production, an allowance of 30 percent post harvest losses has been taken into account. The self-sufficiency in food production in itself is **not the same** as food security because food purchases have not been included, however, the communities with low level of food self sufficiency reflects a higher vulnerability to food security. As can be seen from tables L6 and L8, the worst affected divisions in 1992 and 1994 were Kaloleni, Malindi and Magarini. However, the reliability of data for Ganze division needs further investigation.

Data on anthropometry for the vulnerable group i.e 12-35 months show that Ganze (42.5%) and Kaloleni (26.4%) and Bahari divisions are the ones with the highest rates of underweight although Malindi (24%) and Magarini (22%) divisions also have high rates. Based on food production deficits and anthropometry therefore, it is proposed that Ganze, Kaloleni and Magarini divisions be targetted for interventions (see Nutrition bulletin). Kaloleni division has a high potential for agricultural production. An increase in food production, though necessary but not a sufficient condition will increase the probability of higher nutrient intake and hence better nutrition. A food production plan based on the data from food production of 1994 for Kaloleni and Magarini division has been constructed to act as a traning tool for the members of DFNC. As can be seen from the table below, putting all the land in Kaloleni division under maize alone (1st attempt -L10) will not provide the necessary calorie and protein required by the population, and neither is mixing maize and cowpeas useful in terms of providing sufficient energy, although enough proteins have been provided (3rd attempt). The only mixture that ensures adequate energy and protein is 2nd attempt which provides 1,888,296 Gigajoules of energy against the required amount of 786,583 Gigajoules (see table L4). There is also enough proteins provided as 3,122,782 Kg is achieved against 3,065,315Kg required.

For Kaloleni division therefore, one would recommend that the land be used to plant Maize, Cassava, Cowpeas and Millet/Sorghum as indicated in table L10 (2nd attempt).

The food production plan for Magarini is indicated in table L11. The total area of 8,390 hectares can be put under crops as proposed on the second or third attempt to provide the required calories and proteins. The first attempt falls short of the required energy as well as proteins.

The same procedure can be used for calculating the community's or Household's food needs depending on the population at the community or household size in the case of household.

Table L9. Crop Pattern and Expected Protein/Energy Returns per Hectare

Crop Pattern (kg/ha)	Maize (1200Kg/ha)		Millet/Sorghum (1000kg/ha)		Cassava (18000 Kg/ha)	
	Energy (Gj/ha)	Protein (kg/ha)	Energy (Gj/ha)	Protein (kg/ha)	Energy (Gj/ha)	Protein (kg/ha)
	12	79	9.2	52	167	203

Crop Pattern (kg/ha)	Cowpeas (1000 Kg/ha)	
	Energy (Gj/ha)	Protein (kg/ha)
	12	79

Table L10. Alternative Food Production Plans for Kaloleni Division

Crop/ Crop Mix	1st Attempt			2nd Attempt			3rd Attempt		
	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)
Maize	24,858	298,296	1,960,000	5,000	60,000	395,000	12,429	149,148	980,000
Cassava				10000	1670000	203000			
Millet/ Sorghum				3,000	7,600	156,000			
Cowpeas				6,858	82296	541782	12,429	115,590	2,860,000
Total	24,858	298,296	1,960,000	24,858	1888296	3122782	24,858	264,738	3,840,000

Table L11. Alternative Food Production Plans for Magarini Division

Crop/ Crop Mix	1st Attempt			2nd Attempt			3rd Attempt		
	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)
Maize	8390	100680	662810				1390	16680	109810
Cassava				6000	1002000	1218000	5000	835000	1015000
Millet/ Sorghum				1390	12788	72280			
Cowpeas				1000	12000	79000	2000	24000	158000
Total	8390	100680	662,810	8390	1026788	1369280	8390	875680	1,282,810

Other possibilities can be exploited for the case of Ganze Division since most parts of the division fall under semi-arid and support little or no crop farming. Livestock keeping is of great importance in these areas and could be an area of exploitation. The surveillance system is not collecting data on livestock at the moment, and cannot therefore assist in designing a livestock project, however, such a gap in the data should be looked into in the future.

5.4. Main Accomplishment.

Some of the positive accomplishments in the implementation of the model as at October 1995 are follows:

- 1) the upgraded District Food and Nutrition Committee in place.
- 2) the infrastructure for surveillance in place and the use of the data extraction formats (Annexes 4 to 12) in progress.
- 3) A model Kilifi District Food and Nutrition Bulletin has been produced (see Annex 15) and will serve as a guide for future bulletins.
- 4) Training of District Staff:
 - 4.1. Agriculture field extension workers and health facility workers workers trained on data management in June 1995.

- 4.2 Selected staff responsible for statistics in the Health, Agriculture and Planning and National Development (CBS) ministries trained in computer use in Nairobi, June-July 1995.
- 4.3 All members of DFNC trained on Project Proposal Writing and Project Formulation, July-August 1995.
- 4.4 2 members of the DFNC (Agriculture and Planning and National Development) trained in the Netherlands on Nutrition Policy and Planning.
- 5.0 Sub-committee meetings already taking place.

5.5. Problems and Constraints

Despite these accomplishments, the implementation of the model has encountered bottlenecks that need to be discussed and addressed. These include:

5.5.1. Representative data

In the health information system, with the outpatient morbidity data, the main problem is assessing the true magnitude of morbidity from the number of patients seen at the health facility and the number of visits. This is because some of the revisits are recorded as first visits. In areas where patients cover long distances to health facilities, home treatment for ailments may be used hence diminishing the number of cases recorded at the facilities.

Concerning nutritional status, data is mainly derived from growth monitoring of children under five years brought to the facility especially for immunization. Experience has shown that data on children over 12 months tend diminish as mothers abandon going to the health centres after their children complete immunization schedule. This would therefore affect the data on undernutrition especially at the time when children are most vulnerable.

In agricultural information system, data from the vast division such as Ganze, Magarini and Malindi tend to be inaccurate because the field extension workers cannot cover all the selected farm families. In addition, land adjudication in some of these vast areas has not been completed hence sampling farm families may not be

possible at this stage. Sampling procedures for these areas need to be examined if quality of data is to be improved. It should be noted that for Bahari and Kaloleni divisions, farm families have been enumerated therefore sampling techniques can be applied to improve on the representativeness of data.

5.5.2. Data Transmission

Problems with transport to district offices still remains the major constraint to transmission of data and periodically hinders the arrival of data by 5th of every month as required for the surveillance system. Subsequently, at the compilation stage, there are data gaps. In cases where transmission to the district offices totally fails, computations for the division averages are done regardless of the non responses resulting into inconsistencies when analyzing trends.

5.5.3. Personnel

Currently, there is a personnel problem in terms of number of serving officers. This has affected supervision leading to inaccurate data, late reporting and absence of follow-up. However with the current Government restructuring programme, this problem may not be alleviated in the near future.

5.5.4. Top-Down Approach to Planning

Although the District Focus for rural development strategy has been in place since 1983, the tendency is for intervention programmes to be formulated at the Headquarters. This implies that the community has not been actively involved in the identification of their problems and on discussions on how best to solve the problems. The Planning methodology proposed in this report relies entirely on the assumption that the community will participate in the whole process of problem identification, causal model construction, and identification of possible solutions. An effort should therefore be made to ensure community's participation in the planning process otherwise top-down approach to planning will be a hindrance to the methodology proposed.

6.0 CONCLUSION

The alternative approach proposed in this model takes into account some of the weaknesses that were identified during the exploratory study and the workshop held for officers from Kilifi District in August 1994. The problems of institutional linkages that resulted into poor co-ordination of nutrition activities has been largely improved in two ways. One, the development of multisectoral causal model has encouraged the district personnel realize the complexities of nutrition and that it is a “baby of several foster parents” and cannot be within one institution’s domain. Subsequently, a neutral co-ordinating committee, District Food and Nutrition Committee (DFNC) to be chaired by the District Commissioner (DC) have been created. The committee, apart from co-ordination will also be involved in the analysis and interpretation of surveillance data for decision making.

Secondly, the causal model have been used to select food security and nutrition indicators for the surveillance system. These indicators will be monitored and interpreted to identify the vulnerable areas and risk factors that cause malnutrition in the district. The Bulletin presented in Annex 15 is the first step in assembling existing data generated by two sectors, health and agriculture to identify divisions that are vulnerable and to provide recommendations for possible courses of action. For example, by using retrospective data for the years 1992-94, food self-sufficiency deficits have been calculated for the divisions in the district and ranking done according to vulnerability. Ganze, Kaloleni and Malindi and Magarini have been found to be vulnerable in terms of food security. Kaloleni, however, is largely high potential in agriculture therefore problems in this division may be more complex and require multi-sectoral approach.

Theoretical food production plans have been calculated for Kaloleni and Magarini divisions using retrospective data. These plans show the link between nutrient requirement of the population and food production. Drought resistant crops have been proposed for Magarini division while maize may still play an important role in Kaloleni division so long as it is mixed with other crops e.g cassava, millet and, or sorghum and cowpeas. Although these plans have been produced without involvement of the community, their participation would be most appropriate, especially in the discussions about the crop mixes. As already explained elsewhere, the food production plans are only applicable in the areas with high and or medium potential for agriculture. In areas where the potential for agriculture is minimal, some other alternative interventions may be looked into by discussing with the community their

felt needs, assessing the resources available in those areas and coming up proposal of actions to take through the application of methodology explained in section 4.4.

The analyses for health and nutrition provide an overview of the approach that will be used to analyze, interpret the surveillance data. The analysis will become important when all indicators collected during the same period are analyzed and interpreted. This has not been possible in our first step of analysis. However, Kaloleni still stands out as vulnerable in terms of malnutrition and malaria related morbidity. Reasons as to why Ganze has high malnutrition despite being food secure needs further investigation. With the data currently being collected through the surveillance system using improved formats (see ANNEXES 4 to 12), it is expected that such investigations will be feasible.

The challenge we are faced with is data quality and the sustainability of this approach. This means that the existing collection system needs to be strengthened through ongoing training on detected needs, availing data collection tools and the logistics that goes with activities. To date, some activities have been undertaken towards this direction. To ensure that data generated in the surveillance system is converted into information and the information is used for decision making, selected members of the DFNC have been trained in computer software for data management, nutrition policy and planning and project formulation and project proposal writing. In addition, the extension workers in the Ministry of Agriculture and health facility workers have been trained in data collection procedures on the improved data collection formats which are currently being used to extract data at divisional level. It is envisaged that since this model uses the existing institutional framework and that through the capacity building in the data processing, analysis and interpretation of data into information for decision making, the planning process for nutrition in the district will be sustained and improved. It is our hope that this model shall be improved upon and the refined outcome replicated in other districts in Kenya.

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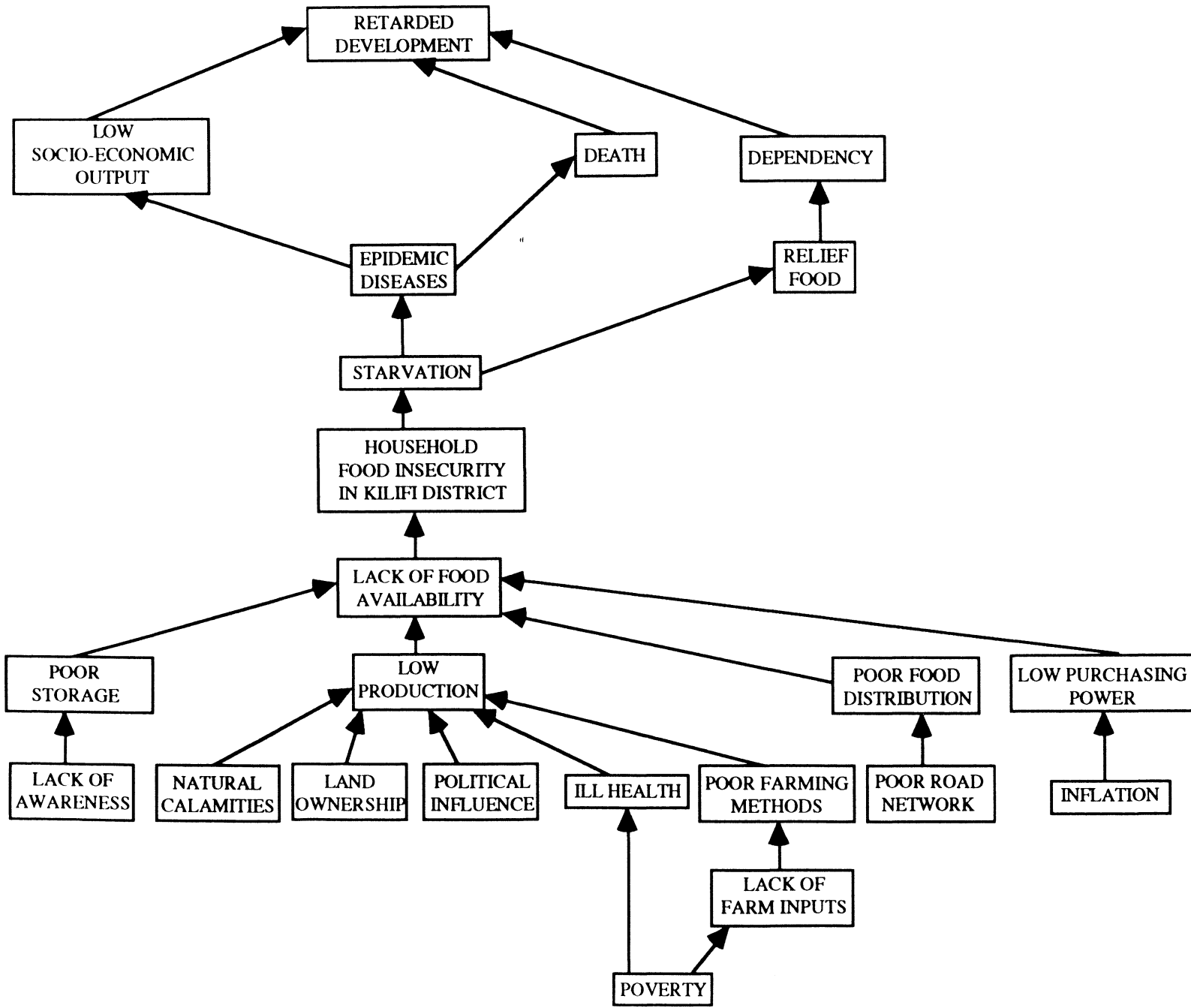
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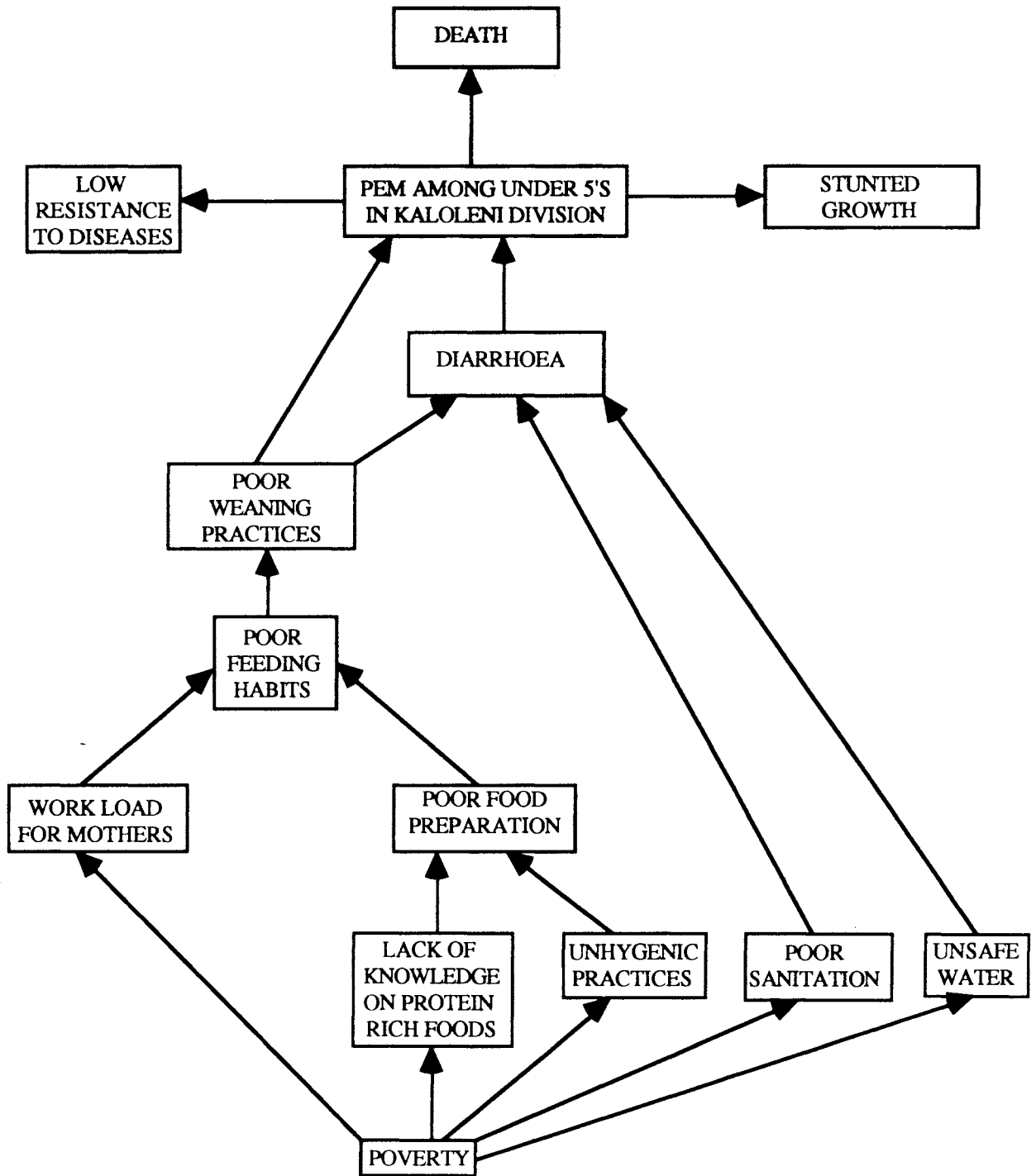
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ANNEXES

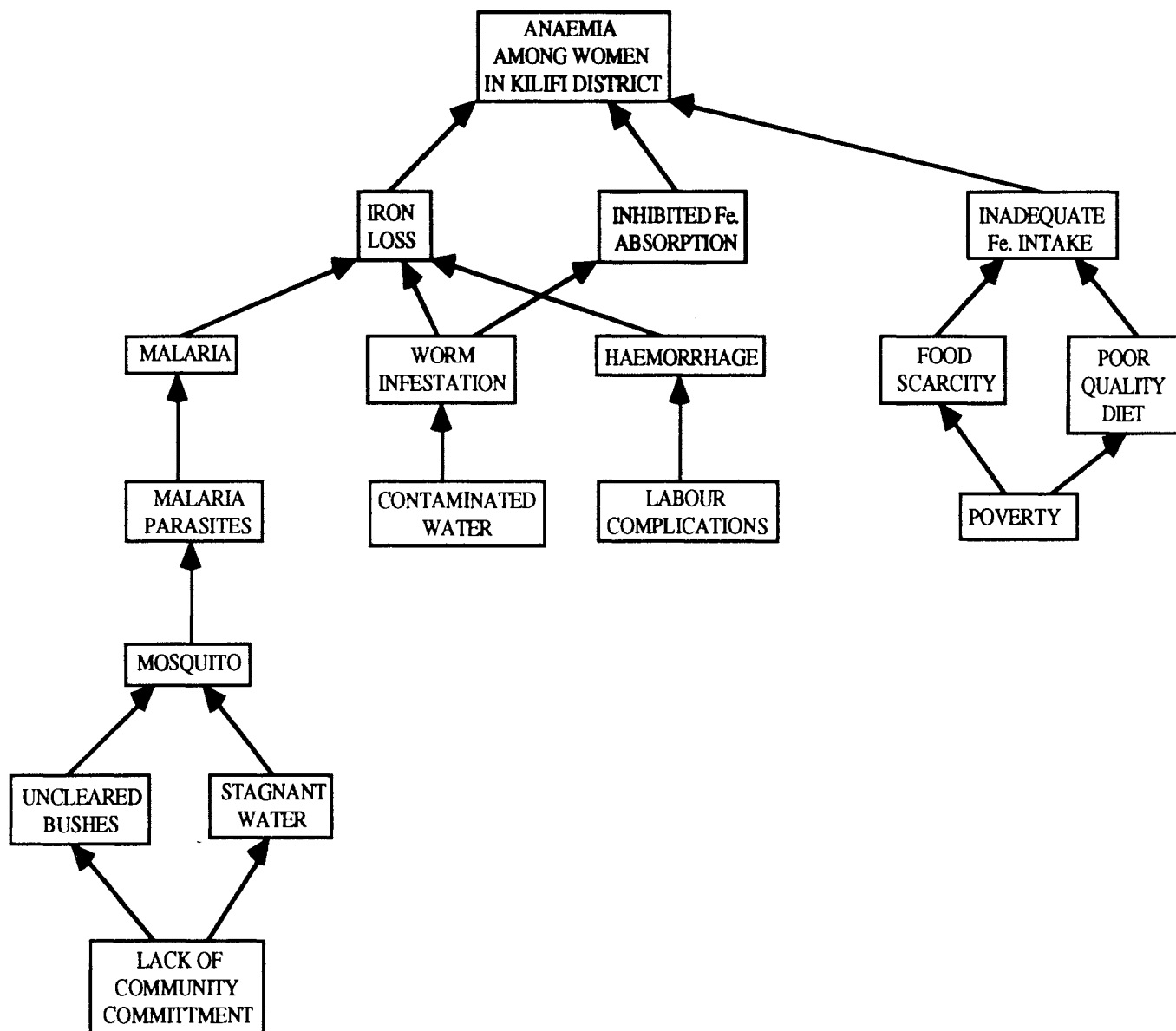


ANNEX 1. Hypothetical causal model: Household Food Insecurity in Kilifi.

ANNEX 3. Hypothetical causal model: Protein Energy Malnutrition among under fives in Kaloleni Division.



ANNEX 4. Hypothetical causal model: Anaemia among women in Kilifi.



ANNEX 6

Ministry of Agriculture, Livestock Development and Marketing

Reporting Officer:

Designation:

1. Area Under Food Crops (Hectares)

Division:

Month 19.....

Citrus
 - Oranges
 - Lemons
 - Grapefruits
 - Tangerines

Crop Name	HECTARES (Ha)		Expected Yields in Tons	Achieved Yields in Tons	Expected Value in Kshs.	REMARKS
	Target	Achieved				
Maize						
Sorghum						
Cassava						
Rice						
S. Potatoes						
Citrus						
Greengrams						
Cowpeas						
Sukuma (kales)						
Mchicha						
Mangoes						
Pawpaw						
Pineapples						
Bananas						
Watermelons						
Tomatoes						
Brinjals						

Implementing Officer:

Designation:

Month 19.....

ANNEX 7 (i)

Ministry of Agriculture, Livestock Development and Marketing

Reporting Officer:

Designation:

Form 3A: Market Prices (Crops)

Month 19.....

Type of Market/Kiosk:

DIVISION:

Farm Commodity	Selling Unit	Price (Kshs.)	Availability	*REMARKS
Maize	KG			
Sorghum	KG			
Cassava	KG			
Rice	KG			
S. Potatoes	KG			
Greengrams	KG			
Beans	KG			
Cowpeas	KG			
Sukuma (kales)	KG			
Mchicha	KG			
Oranges local	KG			
Oranges imported	KG			
Lemons	KG			
Mangoes local	KG			
Mangoes imported	KG			
Pawpaw	KG			
Pineapples	KG			
Bananas	KG			
Grapefruits	KG			
Tangerines	KG			
Watermelons	KG			
Coconut	UNIT			
Tomatoes	KG			
Brinjals	KG			
Other (specify)				

Codes for Availability

1 = Over supply

2 = Normal (Equilibrium)

3 = Under supply

* Comment on commodities in market only.

ANNEX 7 (ii)

Ministry of Agriculture, Livestock Development and Marketing

Reporting Officer:

Designation:

Form 3B: Market Prices (Livestock)

Month 19.....

Division:

Type of Market/Kiosk:

DIVISION:

Farm Commodity	Selling Unit	Price (Kshs.)	AVAILABILITY			*REMARKS
			Over-supply	Normal (Equilibrium)	Under-supply	
Live chicken	BIRD					
Cattle	HEAD					
Goats	HEAD					
Eggs	PER UNIT					
Milk	Tree Top Bottle					
Beef	KG					
Mutton	KG					
Fish	KG					
Other (specify)						

* Comment on commodities in market only.

ANNEX 8

Ministry of Agriculture, Livestock Development and Marketing

Reporting Officer:

Designation:

Form 4: Productivity per Hectare for Different Crop Patterns

Month 19.....

DIVISION:

Crops	Tons/Hectares	Hectares Planted in the area
Maize		
Millet/Sorghum		
Cowpeas		
Cassava		
Maize + Cowpeas		
Maize + Cassava		
Maize + Cassava + Cowpeas		
Millet/Sorghum/Cassava		
Millet/Sorghum/Cowpeas		
Millet/Sorghum		
Cassava/Cowpeas		
Other (specify)		

ANNEX 11

Ministry of Health

Reporting Officer:

Designation:

Month: 19.....

Form 4: Outpatient Morbidity

DIVISION:

Reporting Facilities: (1)

(2)

(3)

Disease No. in Form MOH 701	Disease	NUMBER OF NEW CASES	BY AGE (years)
		Under 5yrs	6 - 60 yrs
1	Diarrhoeal Diseases		
9	Measles		
12	Malaria		
16	Intestinal Worms		
17	Malnutrition		
18	Anaemia		
23	Disease of Respiratory System		
41	Total New Cases		
42	Reattendances (from previous diagonised)		
43	No. of First Visit		

ANNEX 13

Hippopoc Table

Intervention	Input	Process	Output	Outcome	Remark

ANNEX 15

KILIFI DISTRICT

FOOD AND NUTRITION SURVEILLANCE AND PLANNING BULLETIN

**Report for
1992 - 1994**

**FNSP/FNPU PROJECT AND KILIFI DISTRICT
FOOD AND NUTRITION COMMITTEE**

November 1995

Summary

This bulletin summarizes information on selected food security, health and nutritional status indicators. It describes some significant trends that have been observed using selected indicators from the routinely collected data by the health and agricultural information systems. The bulletin is a first step in presenting multisectoral data for planning in the district and is an outcome of the initial stages of implementing the Food and Nutrition Surveillance and Planning infrastructure for Kilifi District. The infrastructure is geared towards monitoring food, health and nutrition indicators to identify the vulnerable administrative divisions, the risk factors associated with food insecurity and poor health and nutritional status. In addition, an important part of this model is the linking of the food and nutrition surveillance information to decision making on intervention alternatives.

The data and information presented in this Bulletin have been charted using data collected during 1992-94 period. Where data gaps could not allow analysis for period to period comparison, available data have been extracted and used to enrich the information. The outcome of the analysis of the data indicate that:

- i) During 1993, Malindi and Bahari received the highest amount of rainfall during the long rains while Ganze division received the least. However Ganze and Kaloleni received well distributed short rains.
- ii) Area under the two main crops i.e. maize and cassava declined for all divisions except Bahari. During the same period between 1992-94, food crop production also declined. However maize production in Bahari division should showed an increase between 1992 and 1994 with over 10 thousand tons being produced in 1993 and 1994.
- iii) Kaloleni, Malindi, Magarini and Ganze were the most vulnerable divisions in terms of food self sufficiency. Data showed that the short-fall in food production was comparatively higher in 1994 compared with 1992. Kaloleni, Malindi and Magarini did not meet even 50% of the protein and energy requirements.
- iv) Bahari division had the highest incidence of malaria, diarrhoeal diseases, intestinal worms while Magarini had high incidences of anaemia and diarrhoea.

- v) Ganze, Kaloleni and Bahari were the most vulnerable in terms of malnutrition among young children. The 12-35 month age group were the most vulnerable. In 1992, 39%, 36%, 26%, 17% and 23% of the children were malnourished in Ganze, Kaloleni, Bahari Malindi and Magarini respectively. In 1994, 43%, 26%, 29%, 24% and 22% respectively, were malnourished.

Recommendations

Based on these findings, it is recommended that for intervention purposes:

- i) Attention should be directed towards Ganze, Kaloleni, Malindi and Magarini divisions, although the accuracy of data for Ganze needs further investigations.
- ii) Drought resistance crops should be encouraged in areas with low rainfall such as Ganze, Malindi and Magarini divisions, both for home consumption and as a source of income. For planning purposes the crop mixes as worked out in appendix 1 should be used, ensuring that more land is allocated to the drought resistance crops such as Cassava, Millet, Sorghum and Cowpeas, as a source of proteins.
- iii) Kaloleni has a high potential for agriculture although the findings indicate there was food deficit in the division between 1992 and 1994. It is recommended that the crop mixes consisting of Maize, Cassava, Millet, Sorghum and Cowpeas be planted on areas as proposed in appendix 1.
- iv) Livestock keeping is of great importance in these areas, especially in Ganze division and should be encouraged as a source of livelihood for the inhabitants. The surveillance system is currently not collecting data on livestock, however, such a gap in the data should be looked into in the future.
- v) Fertilizer use is an important input in food production as it assists in increasing productivity per hectare. In areas where the pressure on land is high or land fertility is low, use of fertilizer should be encouraged to increase food production. It is therefore recommended that data on fertilizer usage in the divisions should be monitored through the surveillance system.

- vi) For planning purposes the acceptability of the community in the implementation of these crop mixes is very important as a means of ensuring sustainability of the farming practices. The District Food and Nutrition Committee members should therefore ensure that these crop mixes are discussed with the farmers for possible adoption .

- vii) There is need to involve the community in the identification of their needs and proposal of actions to take through the triple 'A' cycle approach. The District Food and Nutrition Committee members in collaboration with the local communities in Ganze, Kaloleni and Magarini divisions should construct division-based causal model and design interventions using the triple 'A' cycle approach . This should be followed by project formulation and project proposal writing to be presented to potential donors. This will be one way to enhance the bottom-up approach to planning.

1.0 INTRODUCTION

1.1 Overview

Kilifi district covers an area of about 12,646 square kilometres and borders the Indian Ocean to the east. The district is divided into five administrative divisions namely: Ganze, Kaloleni, Bahari, Malindi and Magarini. The population is estimated at 700 thousand with a density of 59 persons per square kilometre. The majority of the people live in Bahari and Kaloleni where the densities per square kilometre are 207 and 267 respectively. Ganze, Malindi and Magarini are sparsely populated with densities of 37, 35 and 23 respectively.

The rainfall pattern in the district is bimodal, with “long rains” falling from April to June and “short rains” from October to November. This pattern is pronounced in the coastal belt but not noticeable in the hinterland where there is concentration of rainfall in the months of April to June. The rainfall in this area is unreliable and tends towards unimodal pattern thus making it most vulnerable to droughts.

The population in Kilifi is agrarian with 90% depending on agriculture for their livelihood and as such, the seasons are important in terms of food production and many aspects of their life. Seasonality results into variations in agricultural labour needs, differences in food supply and the occurrence of diseases especially malaria and diarrhoea. All these factors have an effect on the outcome of nutritional status of the population.

The district is only able to produce 33% of its food requirements and food production is concentrated along the high potential coastal strip. Figures on food production and requirements aggregated to district level (GOK 1994) show that production of food crops has declined due to under utilization of land. Correspondingly, the nutritional status of young children (a very sensitive indicator of changes in food supply and health conditions) has not shown significant improvement since early 80's (CBS 1983, CBS 1987, CBS 1995).

Lack of multisectoral data disaggregated to divisional level to provide information of vulnerability about different areas in the district has been a major constraint to nutrition planning. This is attributed to the fact that data is aggregated for national level planning.

2.0 OBJECTIVE

The aim of this bulletin is to provide multi-sectoral information to improve the effectiveness of the nutrition planning at district level. The specific objectives are:

1. Provide information on the situation and trends in food security, health and nutrition by division. This will enable the identification of the most vulnerable divisions in the district for development of strategies and intervention.
2. Identify the risk factors, in terms of food security, health and nutrition and their shifting patterns to enable the adjustment of interventions.
3. Provide information that should be used to integrate nutrition considerations in various sectoral chapters in the Development Plan.

3.0 DATA COLLECTION

This report presents data collected by the existing Health and Agricultural Information Systems. The data presented were collected between 1992 and 1994 at divisional level by agricultural extension workers and health facility workers.

3.1 Agricultural Data

The data collected for the reference period includes hectares achieved for various food crops, yields per hectare, actual crop production, retail market prices for various farm commodities and rainfall patterns collected from selected rainfall reporting stations in the district. Rainfall monitoring is carried out by institutions such as schools, DO offices and research stations.

The crop production data were collected from farm families at sub-locational level on a weekly basis. Collection was done from subsistence small holdings using agricultural production estimation methods by agricultural technical assistants who record planted hectares under different crops by observation and by seeking farmers' opinion to arrive at production per sub-location. These were then aggregated to divisional and district totals.

Market prices data were collected from selected markets on a weekly basis during open market days. The extension workers visited the markets (open air and kiosks) and observed five to eight transactions between buyers and sellers for each of the food commodities and record the actual price. These were then averaged and recorded.

3.2 Health Data and Nutrition Data

Data on health status were collected on a daily basis by facility health workers at facility level (dispensaries, health centres and hospitals) when patients came into contact with the health personnel. The outpatient morbidity status were recorded in outpatient morbidity tally sheets and included selected variables namely, number of patients suffering from diarrhoeal diseases, malaria, intestinal worms, anaemia, total new cases and number of first visits. The data were aggregated to divisional level.

Nutritional status data were also collected at facility level and in some cases at community level. Children were weighed using Salter Scales and their weights categorized as “normal” and “underweight” (based on 3rd Centile cut-off point). The data were then entered in the Child Health and Nutrition Information System (CHANIS) tally sheets according to age groups 0 -11 months, 12-35 months and 36-59 months. Data from the reporting facilities were disaggregated to division level.

4.0 DATA ANALYSIS

The data extracted from the formats used in the agricultural and health information systems in their raw form were entered in formatted tables and percentages calculated manually using hand calculators. For the calculations of divisional food needs and nutrient shortfalls from 1992 to 1994, crop production data (actual hectares ploughed and expected productivity of selected crops per hectare) were calculated using population distributions and recommended daily intake as described in section 5.3.1 of the main report.

Graphics software was used to convert the percentage distributions into bar and line graphs. It should be noted that these are preliminary data with limitations and attempts are being made to develop standardized methods of extraction, processing and presentation.

5.0 RESULTS

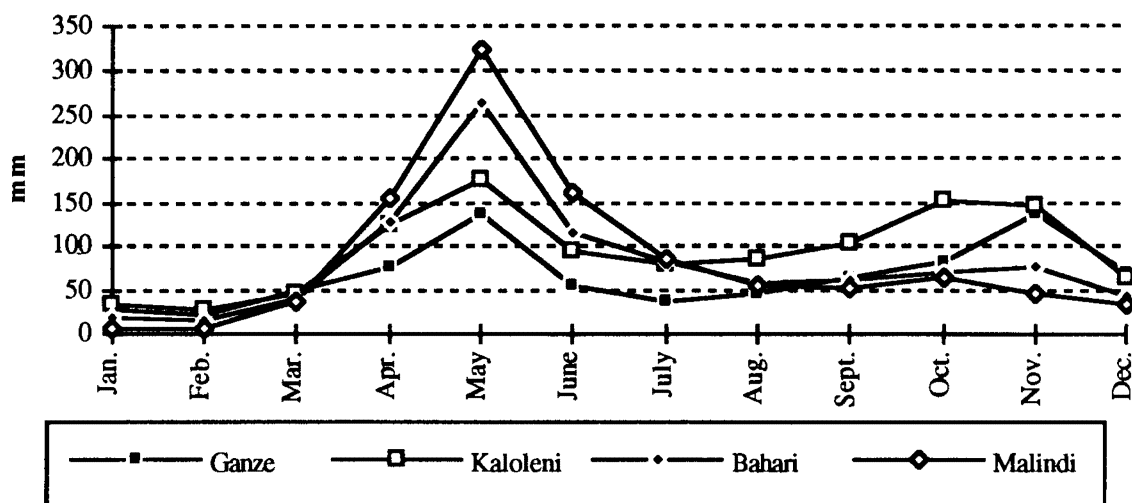
Results described below are for data collected between January 1992 and December 1994 and where there are gaps, available data are used to improve the analysis.

5.1 Rainfall Patterns

Rainfall data is an important indicator which can be used to predict the performance of crops. The “long rains” are heavy in the divisions near the coast, namely Malindi, Bahari and Kaloleni in the months of April and decreases gradually until October. Figure 1 show that in 1993, rainfall was high in Malindi and Bahari divisions. Ganze received the least precipitation during the season. The “short rains” were distinctly higher in Kaloleni and Ganze divisions which received less rainfall during the long rains.

Figure 1.

Mean monthly rainfall by division, Kilifi District, 1993



5.2 Crop Production

5.2.1 Area under crops

Area under crop (hectares) for maize and cassava, the two main crops in the district, are presented in figures 2 and 3. During the period under review, area under maize declined in Kaloleni, Malindi and Magarini. Bahari division registered slight increase

in area under crops between 1992 and 1994. The production for cassava also followed the same pattern observed for maize. Data for Ganze appear to be erratic and should be analyzed further to ascertain accuracy of the reported data.

Figure 2

Hectares under maize by division and year, Kilifi District

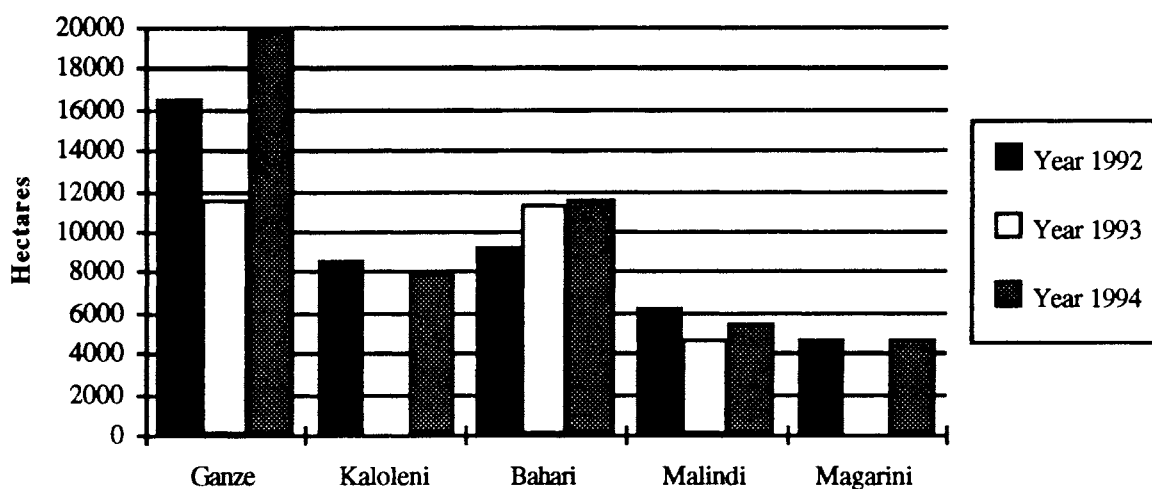
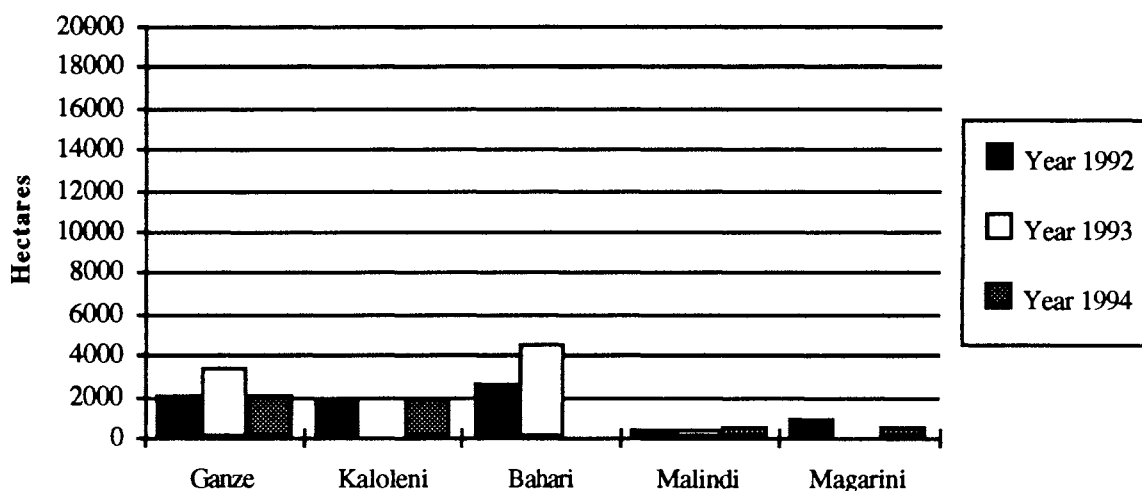


Figure 3

Hectares under cassava by division and year, Kilifi District



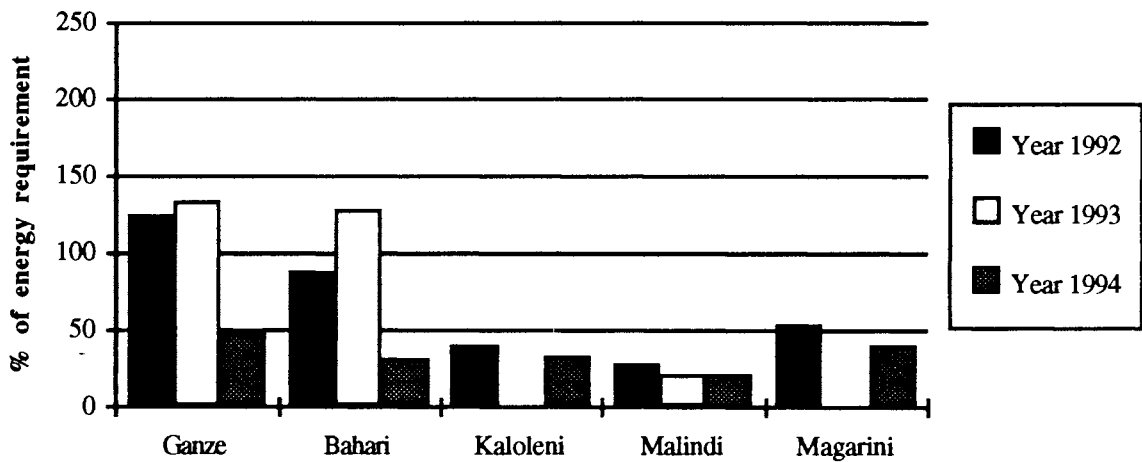
5.2.2 Food crop production

Crop production patterns show that the production of maize, the single most important cereal in the district, declined for all the divisions except Bahari division where an average over ten thousand tons of maize was produced for each of the years under review.

The crop production patterns are further elaborated by the protein and energy requirements met through food production⁶. Overall, apart from Bahari and Ganze⁷, Kaloleni, Malindi and Magarini divisions could not meet 50% of their energy and protein requirement from food production during the period under review.

Figure 4

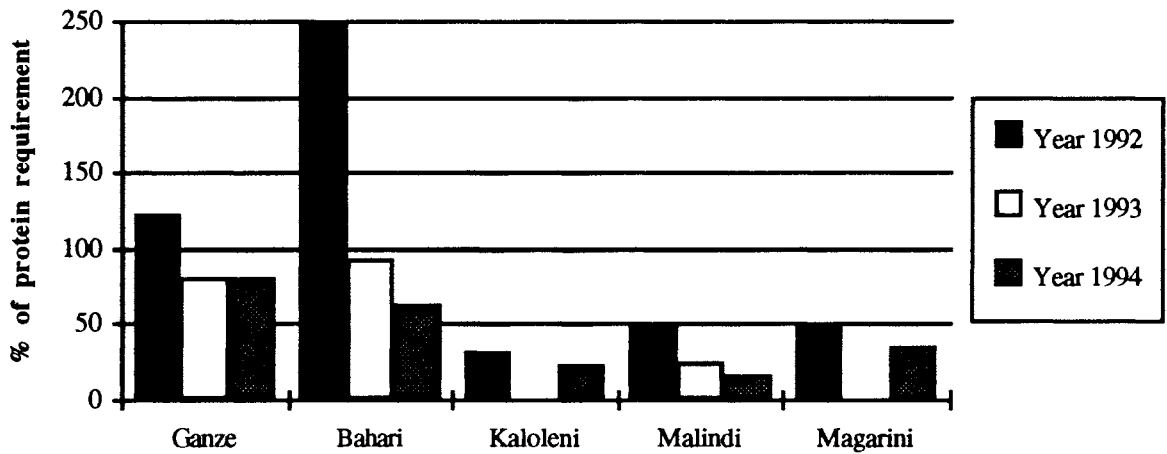
Percentage of energy requirements met from food production



⁶ For the calculation, see the main document pgs. 45 to 49.

⁷ Data for Ganze needs further investigation

Figure 5
Percentage of protein requirements met from food production



5.3 Health Status

The monthly (September to December 1994) new cases for malaria, diarrhoeal diseases and anaemia attending the health facilities were analyzed. Only those health facilities that reported for the four months continuously for the reference period are included in the analysis.

The number of first visits to the health facilities for various ailments (see figures 6 and 7) show that Gongoni Dispensary in Magarini and Tsangatsini in Kaloleni has higher number of patients. Monthly analysis show that first visits were higher in January 1995, for all facilities (600 and above compared with below 500 for other months).

Figure 6
No. of first visits, Kaloleni and Bahari Divisions, Kilifi District

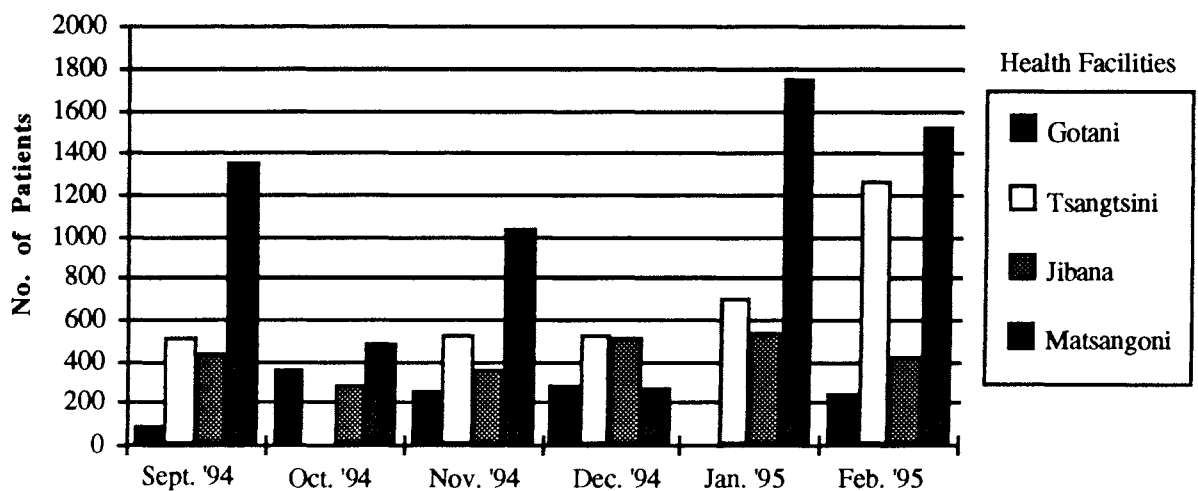
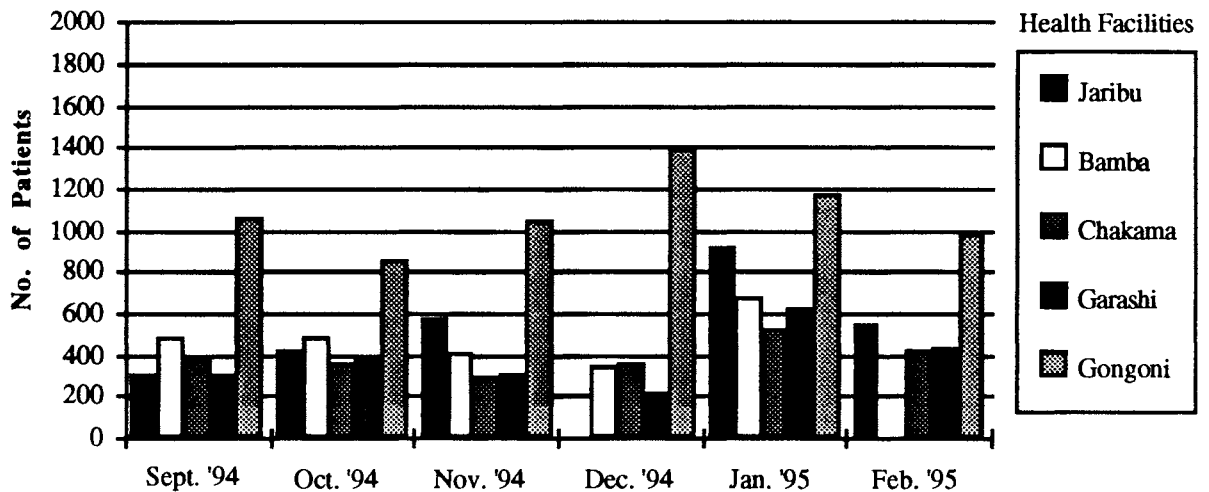
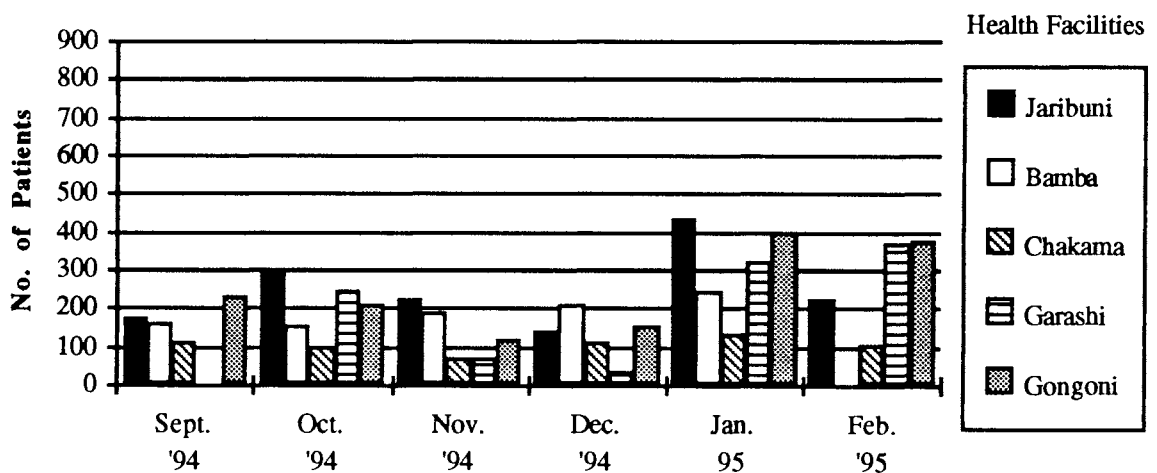


Figure 7
No. of first visits, Ganze, Malindi and Magarini Divisions,
Kilifi District



Monthly incidence show that malaria was more prevalent in the selected facilities than all the other diseases (see figures 8 and 9). This follows the disease pattern which indicate that malaria is the leading cause of morbidity in the district⁸. For the reference period in the analysis, Kaloleni (Gotani and Tsangatsini health facilities) and Bahari divisions (Jibana and Matsangoni health facilities) reported a higher incidence of malaria.

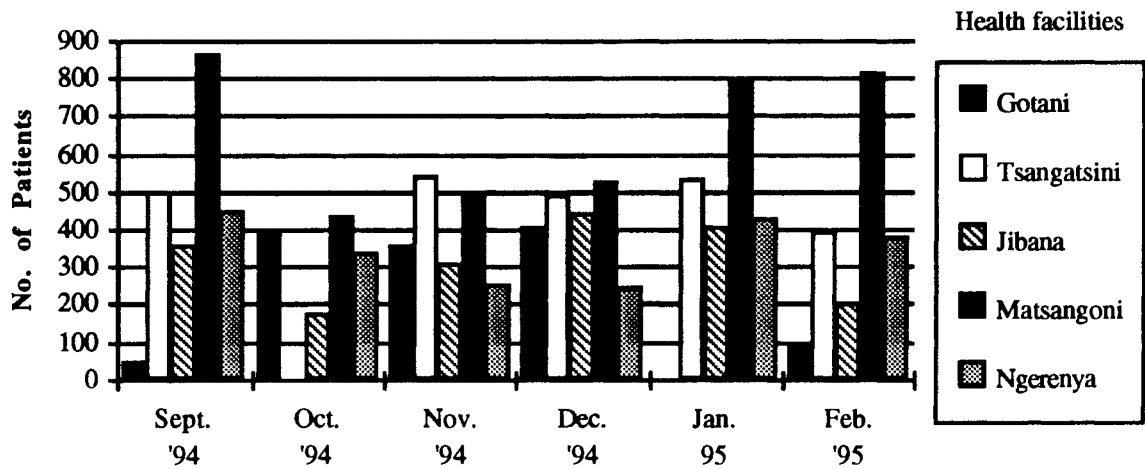
Figure 8
Malaria cases reported in health facilities in Ganze, Malindi
and Magarini Divisions, Kilifi District



⁸ Kilifi District Development Plan, 1994-96 pp 61.

Figure 9

Malaria cases reported in health facilities in Kaloleni and Bahari Divisions, Kilifi District



Diarrhoeal disease appears to be generally prevalent in the health facilities located along the coast and especially in Bahari (Matsangoni) and Magarini (Garashi and Gongoni health facilities). This can be seen in the graphical presentations in Figure 10 and 11, which indicate the facilities located in the hinterland for example Jaribuni and Bamba in Ganze Division and Gotani and Tsangatsini in Kaloleni reported fewer new cases of diarrhoea.

Figure 10

Diarrhoeal cases reported in health facilities in Ganze, Malindi and Magarini Divisions, Kilifi District

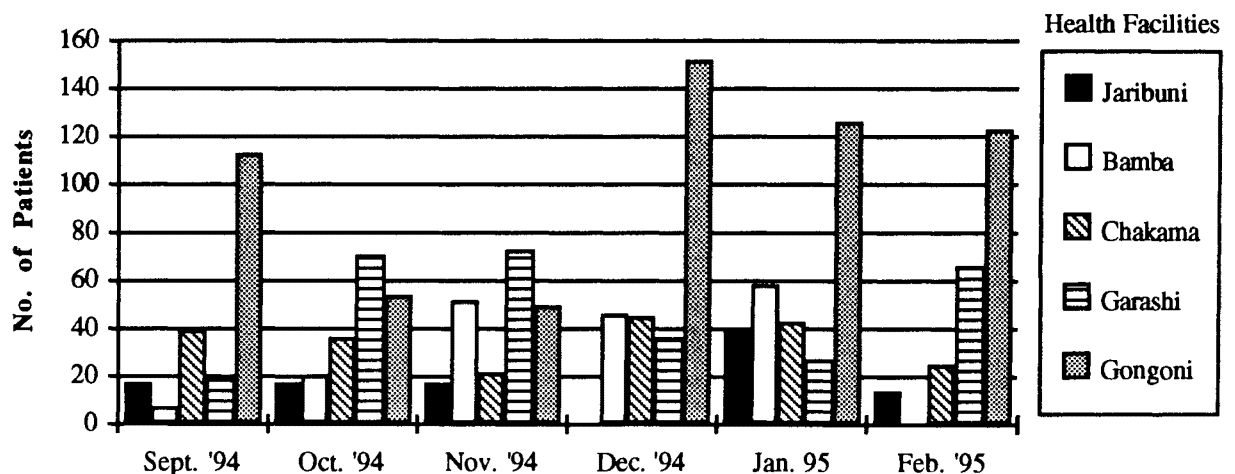
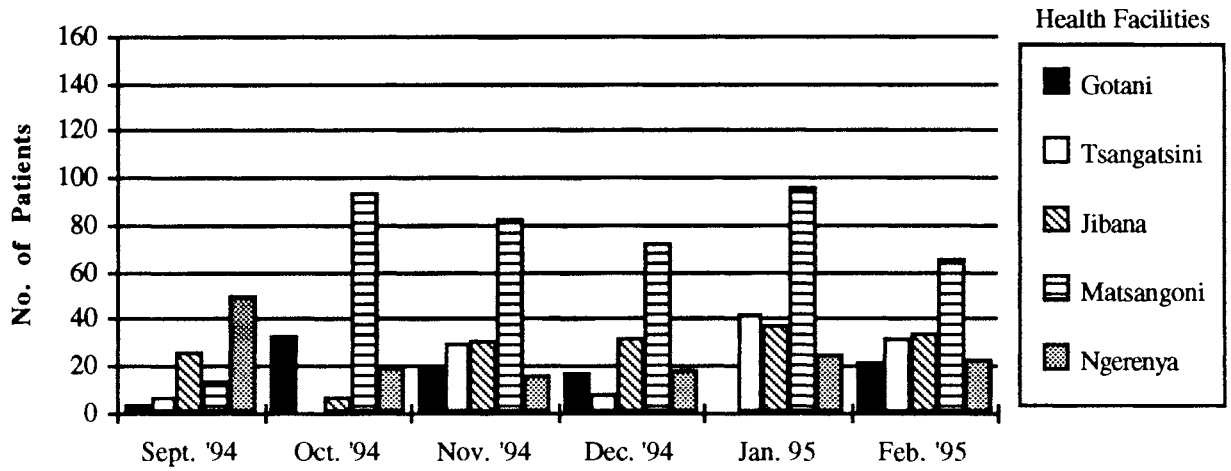


Figure 11

Diarrhoeal cases reported in health facilities in Kaloleni and Bahari Divisions, Kilifi District



Cases of intestinal worms on the other hand were mainly reported in Matsangoni health facility in Bahari Division while health facilities in the hinterland namely, Jaribuni and Bamba, Gotani and Tsangatsini reported lower incidence of intestinal worms during the reference period (see figures 12 and 13).

Figure 12

Cases with intestinal worms reported in health facilities in Ganze, Malindi and Magarini Divisions, Kilifi District

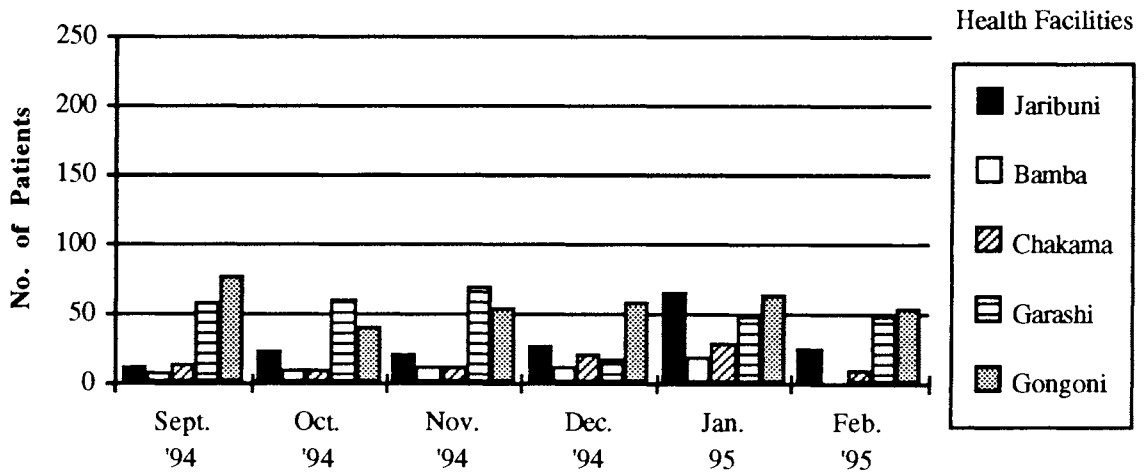
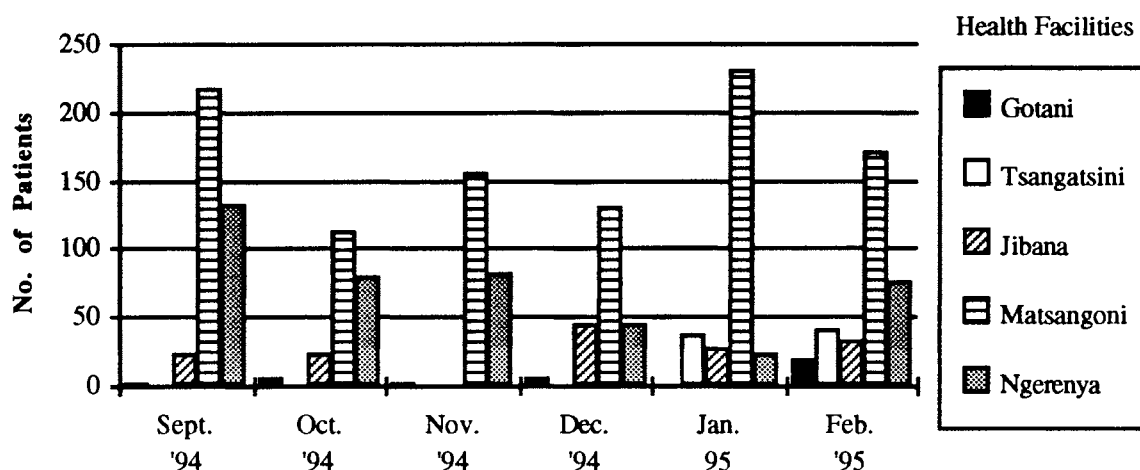


Figure 13

Cases with intestinal worms reported in health facilities in Kaloleni and Bahari Divisions, Kilifi District



Incidence of anaemia on the other hand was high in Gongoni health facility, especially in the months of September and November. In general, as seen in Figures 14 and 15 incidence of anaemia was generally high in facilities in Kaloleni and Bahari divisions.

Figure 14

Cases with anaemia reported in health facilities in Ganze, Malindi and Magarini Divisions, Kilifi District

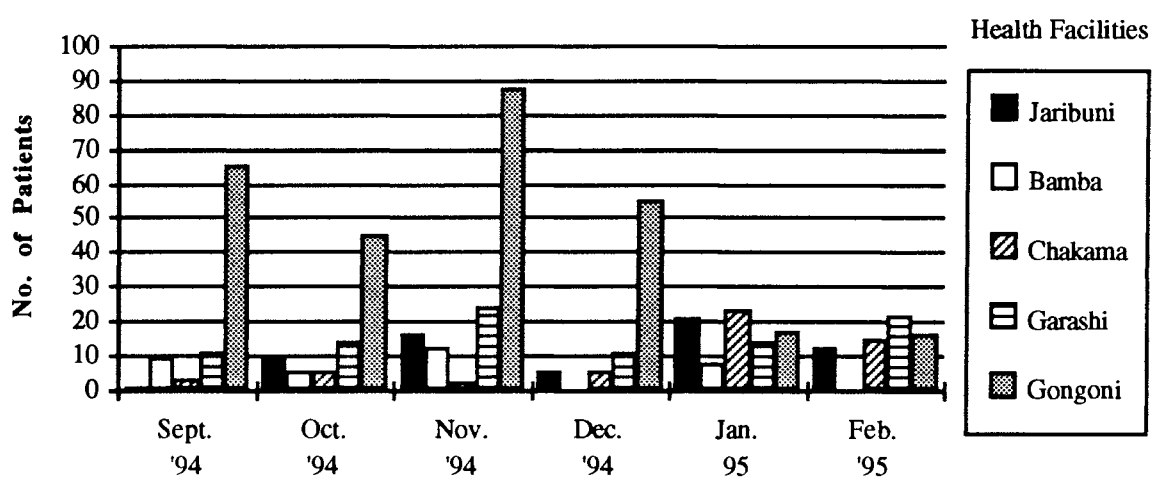
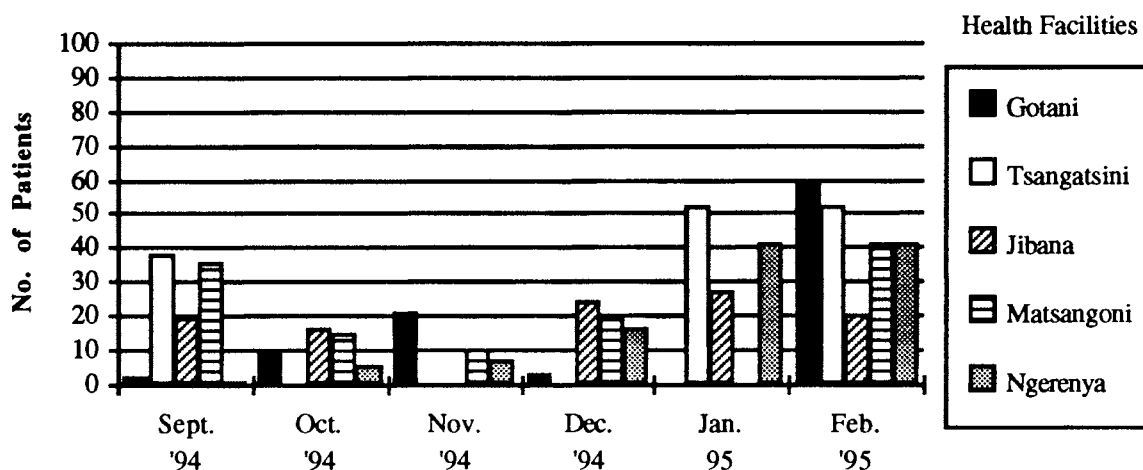


Figure 15

Cases with anaemia reported in health facilities in Kaloleni and Bahari Divisions, Kilifi District



5.4 Nutritional Status

Data collected in the Child Health and Nutrition Information System (CHANIS) gathered in 1992 and 1994 have been used to quantify the nutritional status of the communities. The weight-for-age, a composite indicator of chronic and acute malnutrition have been used to assess malnutrition in the divisions. In the analysis, children aged 0 - 11 months and 12-53 months have been used to identify those divisions likely to be at risk. Figures 16 and 17 shows that in 1992 and 1994, Ganze had a higher percentage of children who were malnourished in both age groups, followed by Kaloleni (since the 0-11 age group appears to be vulnerable compared to other divisions) and Bahari.

Figure 16

Undernutrition among children by division, 1992

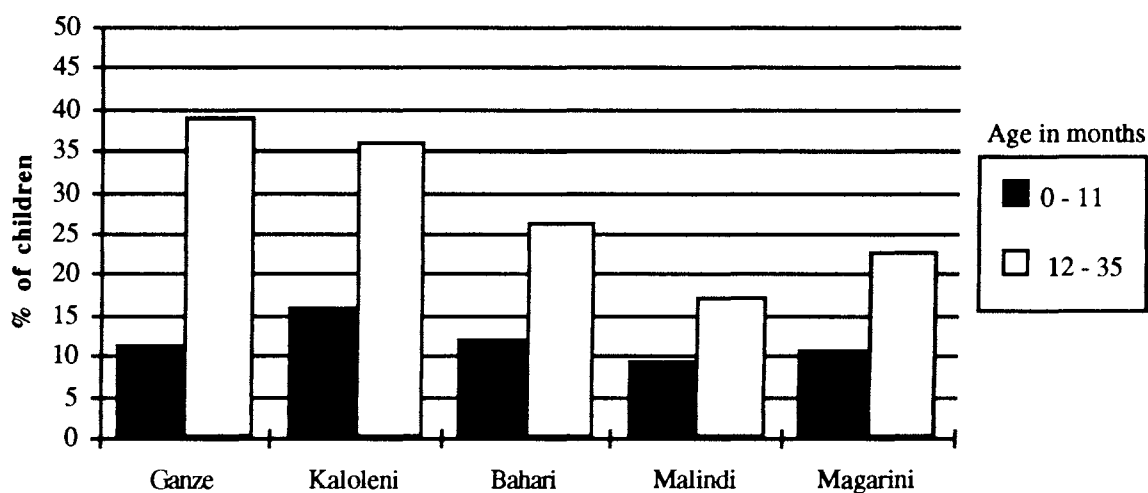
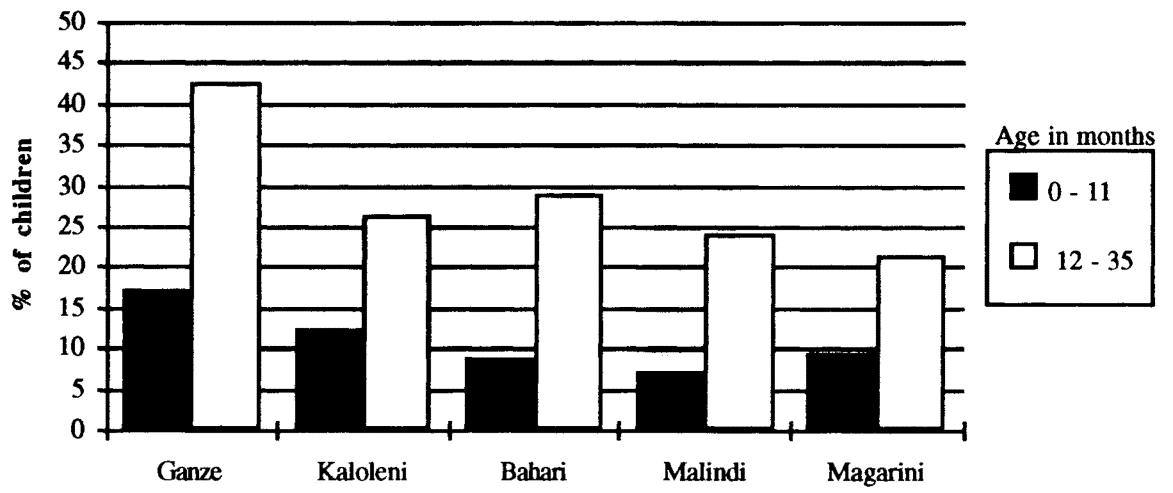


Figure 17

Undernutrition among children by division, 1994



6.0 CONCLUSION

By using retrospective data for 1992-94, it has been possible to provide an overview of the approach that will be used to analyze the food security, health and nutrition data to present information for decision making. The analysis will be more useful when all the selected indicators collected during the same reference period are analyzed and interpreted. This has not been possible in our first step of analysis. However, data shows that **Kaloleni division is food insecure, nutritional status of young children is poor and health status of the populations poor, (malaria and anaemia being prevalent).** This suggests that the division requires multi-sectoral intervention to improve the nutritional status of the population.

Ganze division has high prevalence of malnutrition among young children, however the incidence of the selected diseases is generally low. Data on crop production show that the division is self sufficient although observations have shown the division which falls in the arid and semi-arid zone is generally food insecure. Reasons as to why the division has high malnutrition despite being food secure needs further investigation. Probable interventions for the division are most likely in food security.

Bahari division fall in the medium and high potential agroecological zone and data shows that the food produced in the division can meet nutritional requirement of the population. However, the population suffers from malaria, diarrhoea, anaemia and intestinal worms. It is probable that poor nutritional status may be associated with these diseases. This means that intervention in this division should be geared toward health.

Malindi and Magarini are divisions which have been generally food insecure and cases of diarrhoea is higher in the former division while incidence of anaemia and diarrhoea are high in the latter. For the two divisions, alternative interventions on food security and health should be examined.

Appendix 1

Crop Pattern and Expected Protein/Energy Returns per Hectare

Crop Pattern (kg/ha)	Maize (1200Kg/ha)		Millet/Sorghum (1000kg/ha)		Cassava (18000 Kg/ha)	
	Energy (Gj/ha)	Protein (kg/ha)	Energy (Gj/ha)	Protein (kg/ha)	Energy (Gj/ha)	Protein (kg/ha)
	12	79	9.2	52	167	203

Crop Pattern (kg/ha)	Cowpeas (1000 Kg/ha)	
	Energy (Gj/ha)	Protein (kg/ha)
	12	79

Alternative Food Production Plans for Kaloleni Division

Crop/ Crop Mix	1st Attempt			2nd Attempt			3rd Attempt		
	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)
Maize	24,858	298,296	1,960,000	5,000	60,000	395,000	12,429	149,148	980,000
Cassava				10000	1670000	203000			
Millet/ Sorghum				3,000	7,600	156,000			
Cowpeas				6,858	82296	541782	12,429	115,590	2,860,000
Total	24,858	298,296	1,960,000	24,858	1888296	3122782	24,858	264,738	3,840,000

Alternative Food Production Plans for Magarini Division

Crop/ Crop Mix	1st Attempt			2nd Attempt			3rd Attempt		
	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)	Area (ha)	Energy (Gj)	Protein (kg)
Maize	8390	100680	662810				1390	16680	109810
Cassava				6000	1002000	1218000	5000	835000	1015000
Millet/ Sorghum				1390	12788	72280			
Cowpeas				1000	12000	79000	2000	24000	158000
Total	8390	100680	662,810	8390	1026788	1369280	8390	875680	1,282,810

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